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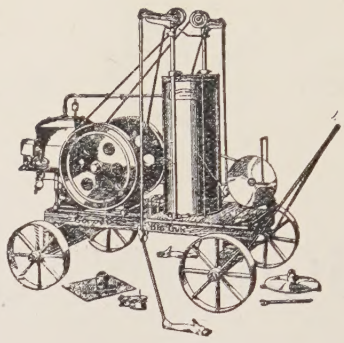

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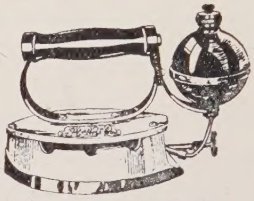

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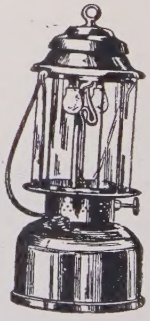

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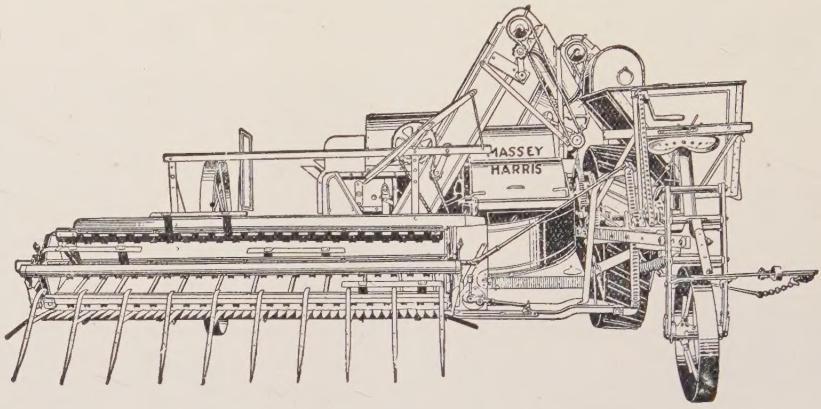

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THE F.A.Q. AND OTHER COMMERCIAL STANDARDS FOR TRADING IN AUSTRALIAN WHEAT.*

GEO. L. SUTTON,
Director of Agriculture, W.A.

As the result of experience with the F.A.Q. Standard it has been realised that in some respects it was unsatisfactory as a commercial trading Standard, and in consequence a critical inquiry has been made into the possibilities of this and other trading Standards, in order to determine whether it was desirable to introduce new Standards for trading in wheat, or to alter the F.A.Q. The results of the inquiry, and the conclusions drawn from them are embodied in this paper.

In this paper the term "Standard" is used in the same way, and has the same meaning, in connection with Australian wheat as the term "Grade" has in connection with American and Canadian wheat. It has been considered necessary to adopt the word "Standard" because Australian farmers and dealers are accustomed, by usage, to regard the grading of wheat to mean to clean it from impurities, and to separate the cleaned grain into lots according to the size of its kernels; and not to mean, as in the Canadian and American sense, to classify commercial wheat according to its character and condition. The word "Standard" in Australia is beginning to be used in the latter sense because of its association with the F.A.Q. Standard.

Commercial standards for the purpose of trading in Australian wheat were unnecessary in the early days of our agricultural history, when the market was a restricted localised one. Under such circumstances wheat could be, and was, sold by sample, *i.e.*, its quality could be judged by a fair sample shown to, and examined by, the buyer at the time of purchase. Immediately, however, the personal contact between buyer and seller was broken or became impossible—as in the case of wheat sold for overseas—then commercial trad-

*Paper read before the Agricultural Section of the Australasian Association for the Advancement of Science at Perth, on 27th August, 1926.

ing standards became necessary in order to smooth out the difficulties incident to trading when long distances separated the seller and the buyer. Such standards are obviously essential in order that buyers who cannot inspect the wheat offered for sale may have indicated to them in a *reliable, understandable and definite manner* the quality of the wheat they may expect to receive after purchase.

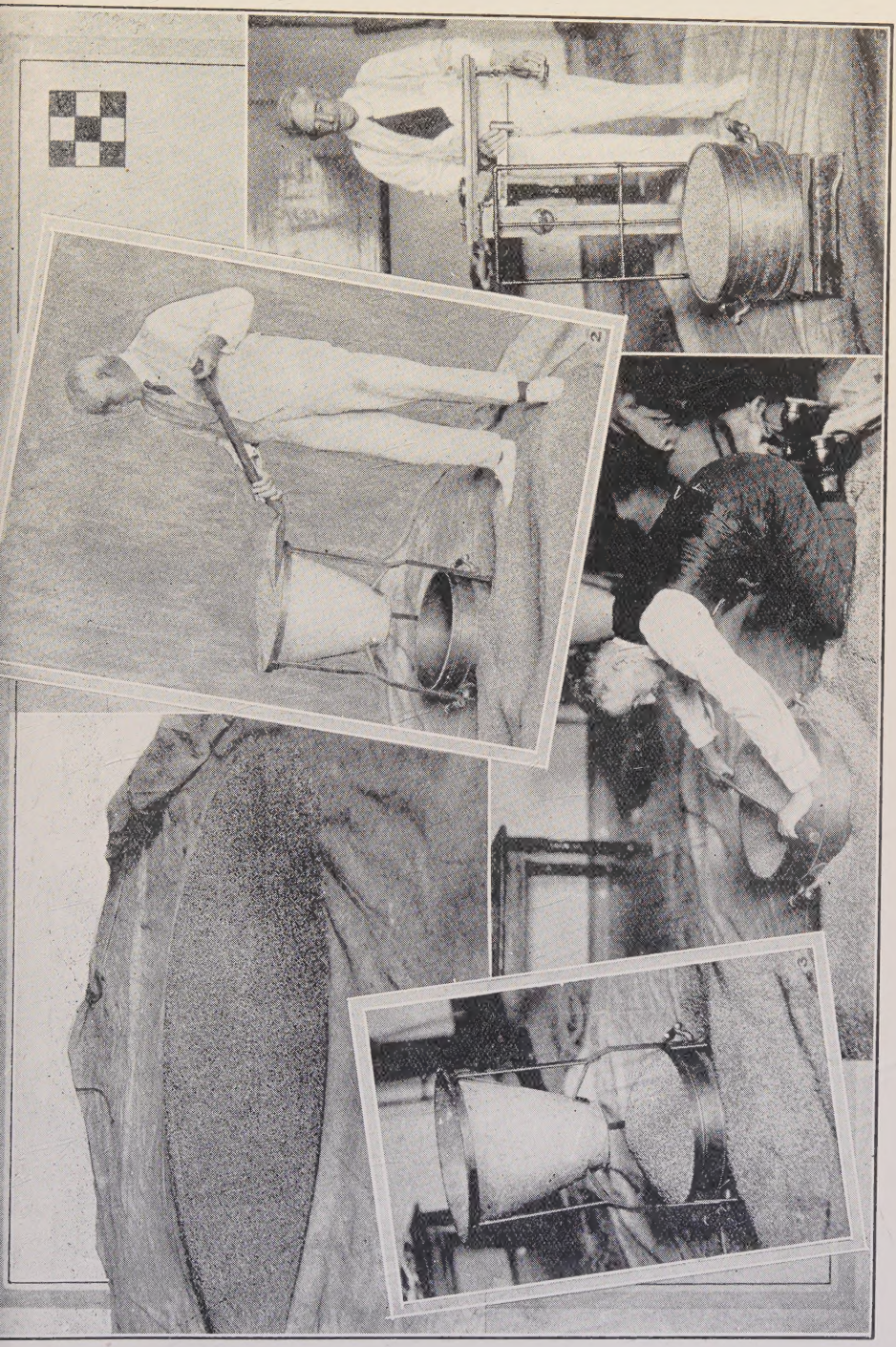
Because of the necessity for the adoption of trade standards which arose consequent upon the evolution of our wheat industry with its expanding production, trading by sample gave place to trading under the F.A.Q. Standard.

The F.A.Q. Standard, by which wheat is at present bought and sold throughout Australia, is so-called because the letters "F.A.Q." are the initial letters of the three words in the term "Fair Average Quality," and by custom have become recognised as the commercial abbreviation for that term, and also because, as far as is practically possible, it represents the fair average quality of the crop of the particular season for which it is fixed. No pains are spared to ensure this.

Although there is an independent standard for each wheat exporting State, the procedure adopted in fixing the F.A.Q. Standard is practically the same throughout the Commonwealth. As the standard fixed relates to the crop of a particular season only, it is necessarily fixed annually. Fixing this standard may be regarded, therefore, as one of the high rites of the commercial wheat world, and by which the wheels of commerce are oiled, and the purchase and sale of wheat facilitated throughout, and beyond, Australia.

In Western Australia the fixing of the standards is undertaken jointly by the Perth and the Fremantle Chambers of Commerce, who bear the whole of the expense in connection therewith, including the collecting of representative samples of wheat from wheat-growing districts. The actual proceedings take place in alternative years at the headquarters of each chamber. Last season the standard was fixed in Fremantle; this season it will be fixed in Perth. The President of the Chamber, at the headquarters of which the proceedings are carried out is, for the time being, in charge of the function, and is assisted by leading wheat traders of the State, who comprise the grain committees of both Chambers.

The actual work of fixing a standard usually occupies the major portion of a day. Those engaged in the work assemble at 10 a.m., and rarely conclude before 5 p.m. Prior to fixing the standard, such premliminary work is carried out by the Secretary of the Chamber where the standard is to be fixed. This consists mainly in obtaining representative samples from throughout the wheat-growing areas. The receiving agents of the wheat-exporting firms operating at the different towns and sidings are circularised about the beginning of December, and asked to send representative samples of the wheat which is being delivered to them in the proportion of 1lb. for every 800 bags received up to about 20th January. To facilitate the collection of these samples suitable bags are sent out by the joint Chambers, also labels, which, when filled in, show the name of the agent from whom the wheat has been consigned; the district in which the wheat was grown; the weight of the sample, and the number of bags represented. The labels are so designed that the amount of work and thought required on the part of the sender is reduced to a minimum. It is particularly specified that the sample shall be



Fixing the F.A.Q. Standard in Western Australia.

a fair average one, and not a picked one, but frequently collectors send special samples with a natural desire to advance the interests of their district. Such picked samples, however, do not benefit any particular district, and only handicap the committee who have to fix the standard. The number of samples received last year from the country was 108, but of these a few were discarded because they did not comply with the necessary conditions set out in the circular. In addition to these there were also eight samples representing 1,295,686 bags, which had been shipped overseas.

Prior to the date fixed for the fixing of the standard, the grain trade sections of each Chamber appoint certain of their number and others to carry out specific duties, *e.g.*, to examine, to check, and to weigh the samples sent in, and to strike and weigh the measured bushel.

The standard is usually fixed early in February, although it is considered by some that it should be fixed at an earlier date. This is undoubtedly desirable, but the requirements of the standard prevent this. If the standard is to be at all representative of the season's crop, it is obvious that a very fair proportion of the crop must be harvested and delivered before a reliable average standard can be determined. The date chosen may vary slightly with the season, but it is always determined as early as possible. Last season February 10th was the date on which the standard was fixed.

The first phase of the proceedings is to examine the samples received to see that they comply with the conditions laid down, and then to weigh out the quantity required in accordance with the number of bags the sample represented, the necessary calculations having been made beforehand by the Secretary. Typical instances would be Kununoppin with 40,000 bags received at the siding, 50 lbs. towards the standard, and Nalya with 3,600 bags, 4 lbs. 8 ozs. The accuracy of the scale master in weighing these lots is almost the despair of his immediate helpers, who, dealing usually in tons and hundreds of tons, are not accustomed to weigh to the fineness of a grain, as they assert he compels them to do.

In some instances the quantity of wheat is not equal to the quota required. In such cases it is customary to make up the deficiency with wheat of similar quality and conditions as indicated by the sample received.

As the samples are weighed they are placed together in a tarpaulin in readiness for mixing. For convenience of mixing—amongst other reasons—the districts producing wheat of similar character have been grouped together. These groups are:—No. 1, or the Central Division, comprising the statistical districts of Northam, York, and Beverley; No. 2, or the Southern Division, comprising Pingelly, Narrogin, and Wagin; and No. 3, or the Northern Division, or the Victoria district. In the first instance, therefore, the samples from the whole of the wheat areas are not placed together, but only the samples from one of the three divisions into which the wheat area has been divided.

The samples from the first division having been weighed and placed on the tarpaulin, are then mixed together very thoroughly, and the quantity required for mixing with grain from the other divisions is weighed and set aside until the final mixing takes place.

The total amount required last year to meet the demand from Chambers of Commerce and others for f.a.q. samples was 450 lbs. This is obtained

from each division on a pro rata basis, and is in accordance with the estimated production of the State, as forecasted by the Government Statistician. Thus, according to the official forecast No. 1 Division may be required to supply, say, eight-fifteenths of the total, or 240 lbs. The samples from each of the other divisions having been obtained in the same way, the three quotas are mixed together in order to obtain the grain representative of the standard.

The grain at this stage is ready to be measured and weighed in the "Imperial" bushel. The weight of the grain filling the "Imperial" bushel is regarded as a useful index to its value for milling; it is therefore important that it should be accurately ascertained. It is also desirable, for purposes of comparison, that the method of ascertaining the weight should be carried out in a recognised conventional manner. The bushel measure is first placed under a funnel-shaped hopper of standard design, holding about 80 lbs.; its outlet, which is at a definite height above the top of the measure, is fitted with a slide, which is kept closed until the hopper is filled. After the hopper has been filled the slide is withdrawn, when the grain gradually fills and overflows the bushel measure, but with a cone-shaped surplus above the top. The surplus above the top of the measure is then struck off by means of a straight edge. It is necessary that the "striking" of the bushel be carried out without moving the measure, as this would cause some consolidation of the contents, and thus increase the bushel weight.

After "striking" the bushel, the weight of the grain is ascertained by careful and accurate weighing on certified scales. The committee, in view of the information available because of their examination of the samples, and their personal experience of the quality of the wheat delivered by farmers, then consider whether the weight of the bushel as ascertained should be subjected to any "draft" deduction (ranging from ¼ to 1 lb.) before being declared. When the decision regarding the standard is arrived at, a declaration, as hereunder, is signed by the members and officials present. The declaration for last season read:—

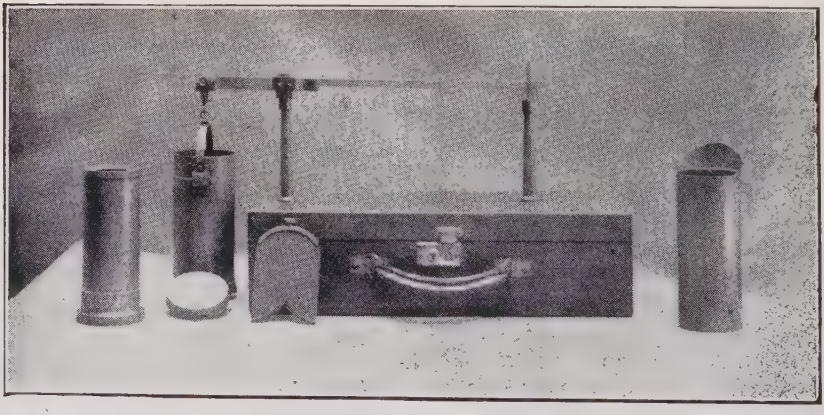
> "We, the undersigned, present at the Chamber of Commerce, Fremantle, on Wednesday, February 10th, 1926, at the fixing of the weight of the standard bushel of f.a.q. Western Australian wheat for season 1925-26, hereby certify that it was fairly taken, and the weight fixed, namely, 62 lbs. per Imperial bushel, in our opinion, is the proper weight for the season 1925-26."

As befitting such an important commercial proceeding, the work is carried out with scrupulous accuracy and attention to detail. Every possible precaution is taken to see that the weighings and calculations are absolutely correct and the mixing thoroughly done. The Chambers of Commerce are justly proud of the equitable methods by which the F.A.Q. Standard has been fixed each year. No effort is spared to make it a fair and just representation of the grain harvested and available for sale. The personal service, voluntarily rendered by members of the Chambers when fixing the standard, is worthy of great commendation. It is often laborious, and would surprise those who are not familiar with what is done.

It is significant that the only detail in the declaration, or definition, of the F.A.Q. Standard concerning its quality is that relating to its bushel weight. Because of the emphasis placed upon bushel weight in the official

declaration, and the particular care taken to determine that of the current season's crop, not only in Western Australia, but in each of the exporting States, it is obvious that the declaration of the bushel weight is considered a reasonable and sufficient method of indicating to prospective buyers the information desired by them regarding the quality of the wheat available for sale, and also that it should play a very important, if not vital part, in the settlement of disputes as to quality. The irony of this, however, is that despite the scrupulous care taken to ascertain and declare it, the bushel weight is considered of such minor importance by the arbitrators dealing with disputed claims that it is entirely ignored by them. The character and condition of the grain as indicated by its colour, brightness, soundness, and percentage of impurities are considered of greater importance than the bushel weight, though no reference is made to these characters in the official declaration.

The importance which has been attached to the declaration of the bushel weight is probably based upon the generally recognised belief that the cleaner the grain (*i.e.*, the smaller the percentage of impurities and other material unsuitable for milling mixed with it) the greater will be its bushel weight. Evidence that, under certain conditions, this belief is well founded is furnished by the fact that the bushel weight of the current season's F.A.Q. Standard is increased by 1 lb. when the unsuitable milling material (3 per cent.) is removed from it. Further evidence in this connection is also furnished in other directions by recently conducted tests into certain phases of this matter by Mr. F. L. Shier, B.Sc., Agr., of the Wheat Branch, Department of Agriculture. In these experiments the bushel weight was obtained by means of what is known as a standard chrondrometer, the test cylinder



The Standard Chrondrometer.

of which has a capacity of 1 pint. This style of instrument gives uniform readings, which, if not actually the same, very closely approach those obtained with the Imperial bushel measure.

To ascertain to what extent the bushel weight is affected by the size of the grains, a sample of the variety "Merredin" was divided into different lots according to the size of the kernels by means of suitable sieves, *i.e.*, it

was graded as the term is understood in Australia. The sieves used were as illustrated, and were made from the punched steel used for making commercial grading screens; they had long rectangular perforations, the widths of which were 2.75, 2.50, 2.25, and 2.00 m.m. respectively, with a length of about 25 m.m. Sieves with wider perforations than 2.75 m.m. were not used as it was considered that all grain retained on a 2.75 m.m. sieve could be regarded as of prime milling quality. The bushel weights of the grains as retained on the screens, with perforations of the width shown, and of the screenings or material which passed through the 2.00 mm. sieve are as hereunder:—

The Relation Between the Bushel Weight and Size of Kernel in Cleaned Grain.

Size of sieve	2·75	2·50	2·25	2·00	Screenings
Bushel weight	63¾	62¼	56½	56	50

There is a constant but irregular decline in the bushel weight as the diameter of the grain decreases. The irregular variations between bushel weights of the respective lots of grain are believed to be due to the differ-

The sieves used in the experiment.

ences in physical character. That retained on the 2.75 and 2.50 sieves was sound and whole grain differing only in size; that on the next two sieves consisted mainly of pinched and broken grain, whilst the screenings were made up of small broken pieces of wheat, and the usual debris found in commercial grain.

The effect of adding "chaff" (the glumes of the wheat kernel) to a sample of cleaned large grain as retained on a 2.75 m.m. sieve is shown by the results recorded in the following table:—

Effect of adding Chaff to cleaned large grain over 2·75 mm.

Per cent. chaff in sample.	Per cent. prime grain.	Bushel weight.
0	100	63¾
½	99½	62⅝
1	99	61½
1½	98½	60¾
2	98	59⅜
2½	97½	58⅝

These results show what a marked depressing effect the addition of the light bulky "chaff" has upon the bushel weight good milling grain, the addition of only ½ per cent., or less than one-third per lb. per bushel, causing a decrease in the bushel weight of over 1 lb.

The screenings—a heavy and less bulky material—has a much less depressing effect upon the bushel weight of the cleaned large grain, as has also the addition of comparatively large quantities of the smaller grains as retained on the 2.50 m.m. sieve, and a mixture of smaller grain retained on 2.50, 2.25, and 2.00 m.m. sieves. The mixture of smaller grains consisted of one part of grain retained on the 2.00 m.m. sieve; six parts of that on the 2.25 m.m. sieve, and thirty parts of that retained on the 2.50 m.m. sieve. The proportions were decided upon as being approximately those found in the F.A.Q. Standard, when the screenings and chaff had been removed. The results obtained with these mixtures were:—

The effect of adding Screenings under 2·00 mm. to cleaned large grain 2·75 mm.

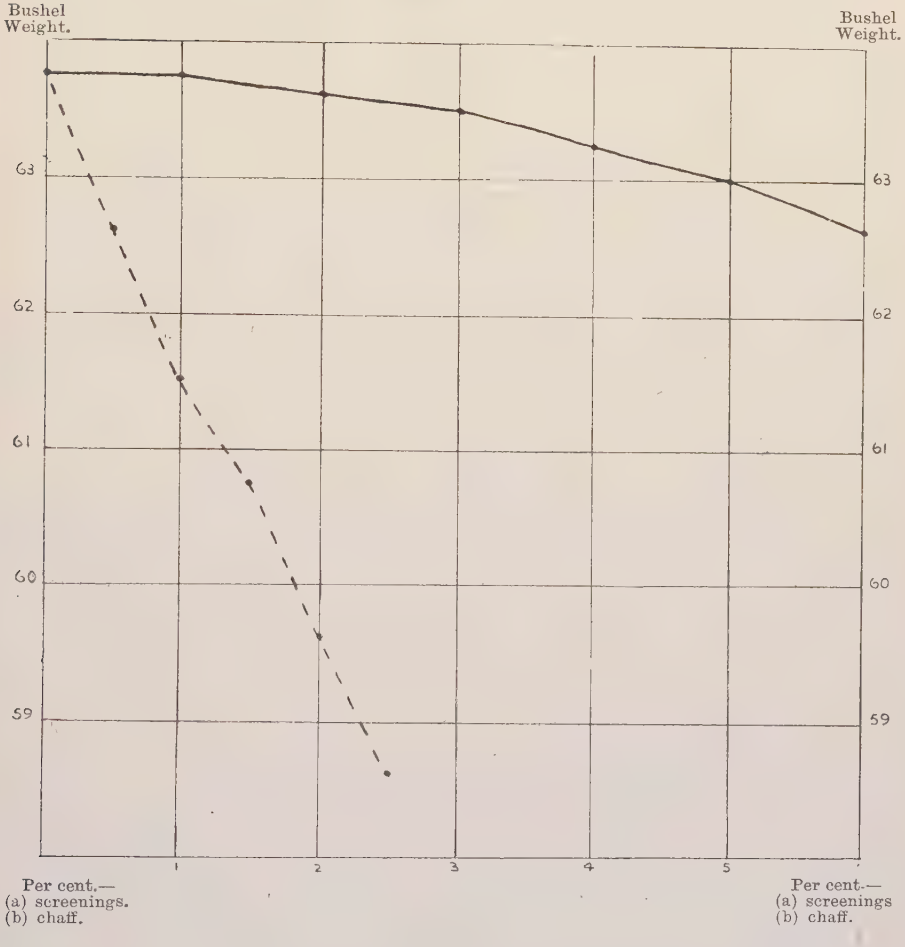
Per cent. screenings.	Per cent. large grain.	Bushel weight.
0	100	63¾
1	99	63¾
2	98	63⅝
3	97	63½
4	96	63¼
5	95	63
6	94	62⅝

Graph showing the effect on the Bushel Weight of adding—

(a) Screenings under 2.00 mm. .. ——————

(b) Chaff .. .. - - - - - - - - - - - - - - -

to Cleaned Large Grain over 2.75 mm.



The effect on the Bushel Weight of adding smaller grain (2·50 m.m.) to larger grain (2·75 mm.)

Per cent. smaller grain.	Per cent. large grain.	Bushel weight.
0	100	$63\frac{3}{4}$
17	85	$63\frac{1}{4}$
20	80	$63\frac{1}{8}$
25	75	63
33	66	$62\frac{7}{8}$
50	50	$62\frac{3}{4}$

The effect on the Bushel Weight of adding a mixture of smaller grains to large grain.

Per cent. mixture.	Per cent. large grain.	Bushel weight.
0	100	$63\frac{3}{4}$
17	85	$62\frac{1}{2}$
20	80	$62\frac{1}{4}$
25	75	62
33	66	$61\frac{5}{8}$
50	50	61

Graph showing the effect on the Bushel Weight of adding—

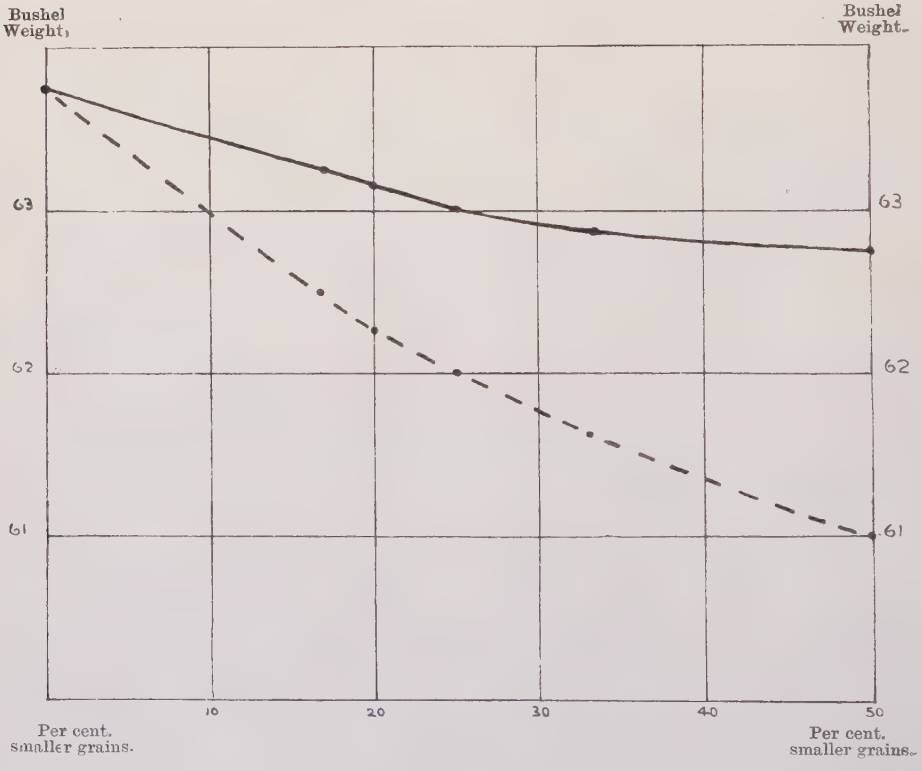
(a) Smaller Grains (2.50 mm.) .. .. _____

and

(b) A Mixture of Smaller and Broken Grains - - - - - - - - - - - - - - -.
to Larger Grains (2.75 mm.)

Mixture of Small and Broken Grains—

Under 2.75 and over 2.50 mm. .. .. .. 30 parts.
„ 2.50 „ 2.25 mm. .. .. .. 6 „
„ 2.25 „ 2.00 mm. .. .. .. 1 part.



In addition to the manner in which the bushel weight of grain is affected by its physical characters and the impurities with which it is mixed, it is also affected by the varying amounts of moisture which may be found in the grain.

To obtain some definite information in this connection trials were conducted during July of this year with three varieties of wheat—"Carrabin," "Florence," and "Nabawa" at the Government Analytical Laboratory by Messrs. E. G. Lapsley, B.Sc., Agr., and F. L. Shier, B.Sc., Agr. The wheat of each variety was first cleaned and passed over the 2.75 m.m. sieve, and that retained on the sieve was used in the experiment. The procedure then adopted was:—

1. To estimate the water content of each variety and determine its bushel weight.

2. (a) To lower the moisture content of portion of each sample to approximately 8 per cent. by exposure in water oven.

   (b) One hour later—after cooling—to determine the moisture content; the bushel weight; the absolute weight of 100 grains, and the contents of the test cylinder.

   (c) To determine the bushel and other weights as in (b) after remaining in sealed jar for twenty-four hours.

3. (a) To bring the moisture content of a portion of each sample to approximately 13 per cent. by adding a calculated amount of distilled water and revolving it in a small conditioning drum for half an hour.

   (b) One hour later to determine the moisture content, bushel weight, etc., in 2 (b).

   (c) To determine the bushel and other weights as in 2 (c) after remaining in sealed jar for twenty-four hours.

4. (a) To bring the moisture content of portion of each sample to approximately 18 per cent., by adding a calculated amount of distilled water, and revolving it in a small conditioning drum for half an hour.

   (b) One hour later to determine the moisture content, bushel weight, etc., as in 2 (b) and 3 (b).

   (c) To determine the bushel and other weights as in 2 (c) and 3 (c) after remaining in sealed jar for twenty-four hours.

The results obtained are as in Table I.

TABLE I

SHOWING THE EFFECT OF AN ALTERATION IN THE MOISTURE CONTENT OF WHEAT UPON THE BUSHEL AND OTHER WEIGHTS.

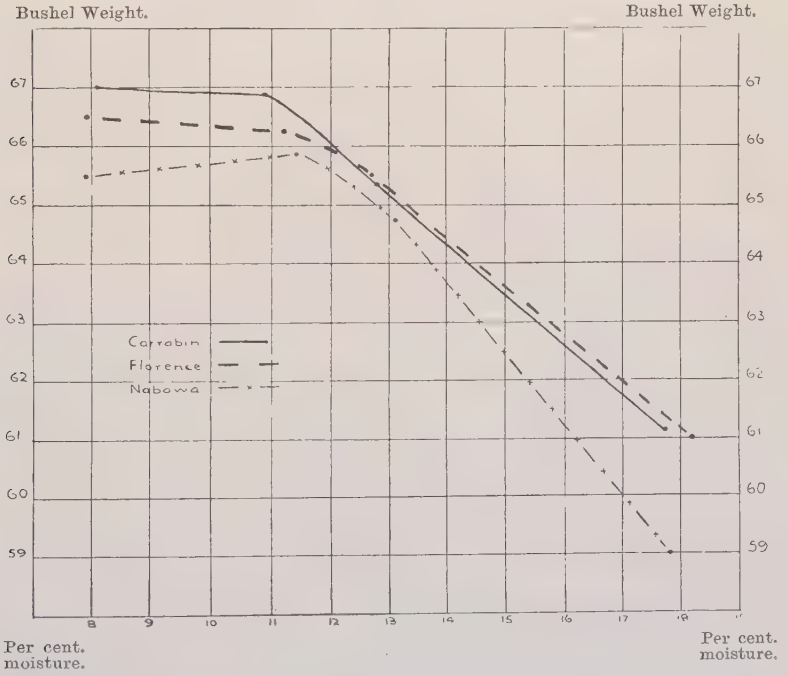
Approximate Moisture.	CARRABIN.				FLORENCE.				NABAWA.			
	8%	Original.	13%	18%	8%	Original.	13%	18%	8%	Original.	13 %	18 %
Actual moisture per cent.	8·1	*10·9	12·8	17·7	7·9	*11·2	12·7	18·2	7·9	*11·4	13·1	17·8
Bushel weight in lbs.— After 1 hour ...	67	66⅞	64⅛	...	66½	66¼	64½	...	65½	65⅞	63⅞	...
After 24 hours ...	67	66⅞	65⅜	61⅛	66½	66¼	65½	61	65½	65⅞	64¾	59
Absolute weight in grammes 100 grains taken ...	4·8284	4·8608	4·9812	5·2308	4·5400	4·4854	4·5894	4·9816	5·6904	5·8016	5·9954	6·1798
Contents of test cylinder grammes ...	475·5	473	456·5	433	470	468·5	459	432	464	467	453	417·5

* As found in original and untreated sample.

Except in one instance—that of "Nabawa" when it contained 11 per cent. of moisture—there is in all other cases a decline in the bushel weight as the moisture content of the grain increases, as may be seen readily from the graph herewith setting out the results of this investigation. The decline in the bushel weights as the moisture content increases from 8 per cent. to 11 per cent. is almost negligible. This is important, for as the moisture content of Western Australian wheat when harvested is about 8 or 9 per cent., these samples were taken at the end of the export season, as this range may be regarded as the normal seasonal range during the marketing period. The bushel weights, however, decrease more rapidly as the moisture increases to 13 per cent., and still more rapidly to 18 per cent.

The difference in the ratio of decline is probably due to the fact that in the first stage of increase in the moisture content the lowering of the bushel weight is mainly due to the lowering of the specific gravity of the grain consequent upon a reduced proportion of the heavy starch, whereas in the second and third stages there is an additional factor operating, in that the grains are so much enlarged by the additional water that the spore space in the measure is very considerably increased.

Graph showing the effect on the Bushel Weight as the result of Altering the Moisture Content of the Grain.



As is well known, the bushel weight is also affected by variety and by differences in the chemical composition of the grain, caused invariably by variations in the seasons. The climatic conditions which have a tendency to bleach grain or destroy its brightness, also tend to produce grain of light bushel weight, and a lowered yield of flour. Similar results are obtained with climatic conditions which produce wheat with a thick skin, or bran.

The conclusions which may be drawn from the result of the trials given regarding some of the factors which affect the bushel weight are:—

(1) That with commercial mixtures of wheat consisting of the same varieties in the same condition, the bushel weight is an index to the quantity of millable grain it contains. The higher the bushel weight the larger the quantity of the latter, and the greater the milling value.

(2) That with cleaned grain of the same variety, or mixtures of the same variety, the bushel weight is an index—(a) to the size of grains, and (b) to the moisture content of the grain.

The higher bushel weights indicate the larger and plumper grains the lower moisture content, and the better condition of the grain; therefore, in each case the higher the bushel weight the greater the milling value. This is invariably the position, as no case is known in which low milling value is associated with high bushel weight; in a general way, therefore, the bushel weight does supply some information regarding milling value. Why, then, is it not accepted by the arbitrators in disputes as to quality? This aspect will now be discussed.

It will be noticed from the results given that the difference in the bushel weights does not bear a constant relation to the milling value. For instance, a mixture consisting of 99½ per cent. of prime grain and ½ per cent. of unmillable material ("chaff") has a bushel weight of 62⅝ lbs., and a mixture of 94 per cent. of the same prime grain and 6 per cent. of unmillable material ("screenings") has the same bushel weight; that is to say, the former with over 5 per cent. more millable grain has the same bushel weight as the latter.

Further, the separate factors which affect the milling value are not of equal importance. For example, it is well known that the brightness of the grain is of more importance than the size of the grains, or the amount of unmillable material it contains. Thus, it is more important to have bright grain than large grains, or bright grain with many impurities, than bleached grain with few impurities. It is, therefore, obvious that, except in a very general sense, the bushel weight cannot be used to assess correctly the comparative value of two parcels of wheat which differ in more than one respect, as commercial parcels invariably do. Consequently a statement of the bushel weight only cannot indicate to what extent the milling value is affected separately by:—

(a) Variety.
(b) The amount of impurity it contains.
(c) The percentage of grain other than prime, and
(d) The moisture content, or
(e) Its character, as indicated by a bright appearance as compared with a dull or bleached appearance.

It is more important that the miller, or purchaser on his behalf, should have information on these points than to know the bushel weight only, but with such information at his disposal the bushel weight has a very real and specific value. It is obvious, then, that any commercial standard for our wheats should contain information on these points, and because the F.A.Q. Standard does not supply this information which is so essential to a buyer, the arbitrators in Great Britain are justified in their attitude, and are com-

pelled to base their awards, not upon the careful determination of the bushel weight of the grain in dispute by means of a suitable mechanical appliance, but upon their skilled judgment, after examining and comparing a sample of the disputed grain with the actual sample representing the F.A.Q. Standard.

Australia is in effect still trading in wheat by sample instead of, as is generally believed, by "standard" or "grade." That this is so is proved by the invariable practice of buyers immediately on the arrival of early shipments giving notice of intention to arbitrate after the arrival of the F.A.Q. Standard sample, o the quality of the wheat shipped, and, further, by the right which they possess, and which is recognised by the Australian sellers, to allow these claims to remain in abeyance until 21 days later than the receipt of the F.A.Q. Standard sample. It can thus happen that final payment regarding the sale of a wheat cargo may remain in abeyance for three or more months after the sale has been made. Such a condition cannot be regarded as satisfactory, and it would be difficult to find any other commodity of importance subject to such trading conditions.

It is obvious, then, that the F.A.Q. Standard does not fulfil all the requirements of a modern trading standard. Its declaration is reliable and understandable, and very definite as far as it goes, *i.e.*, regarding the bushel weight; it is deficient, however, in that it does not go far enough. To meet this deficiency the declaration should be elaborated so as to include, in addition to the bushel weight, definite information regarding the amount and character of the millable grain it contains. It is not necessary to supply information regarding the varieties it may contain, for though the same varieties may not be grown throughout Australia, or even in all districts in the same State, their type is practically the same; they are also grown under very similar climatic conditions, and any difference due to variations in this latter respect will be reflected in the character of the grain. Further, it is not necessary to include any reference to moisture content, because our wheats are invariably very dry, and under normal conditions any variation in this respect during the marketing period is so slight as to make little or no difference in milling value. Neither is it necessary to include any reference to the proportion of large to small grains, as any variation in this respect is within reasonable limits, and this factor is at present of minor importance.

If regard had been given to the requirements necessary to remedy the deficiency referred to, the declaration regarding the f.a.q. of the season just ended would have been elaborated, so that a description of it, couched in a style similar to that used in connection with American standards, would have read:—

F.A.Q. Standard Wheat.

F.A.Q. Standard wheat shall be dry and undamaged by moisture.

It shall be free from weevils or other insects, and from smutty, musty, or other commercially objectionable smell.

It shall contain not more than 3.00 per cent. of foreign matter, and screenings (from 2 m.m. sieve): of the foreign matter the percentage by count of the unbroken smut balls shall not exceed 1/5th per cent. of the millable grain.

Of the millable grain there shall be 98.5 per cent. white, sound, bright grain. Of the other grain there shall not be more than one-half per cent. of bleached grain. The weight per bushel shall not be less than 62 lbs.

This elaboration has in fact been necessary for the guidance of the departmental officers engaged in the inspection of certificated cargoes and which this season comprised 24 per cent. of the exportable surplus—11,662,111 bushels. Without this extended definition and, because of it, the ability to utilise the assistance due to its mechanical division into component sections, it would not have been possible to accept the responsibility attached to the issue of a Government certificate.

Another very serious objection to the present F.A.Q. Standard is the late date at which this standard can be fixed. As already pointed out, the very nature of the standard requires that a large proportion of the season's crop shall have been harvested before the standard can be fixed. The delay is, therefore, unavoidable whilst such a standard is retained. This feature was most unfavourably commented upon by the President of the Liverpool Corn Trade Association in March, 1923, when addressing the Australian editors then touring Great Britain. He pointed out that one of the troubles of the trade in Liverpool (which, of course, applied to other parts of the United Kingdom) was the delay which occurred in connection with the forwarding of standards of the new Australian crop. He further stated that it was then March, and the standards had not been received, although the cargoes sold according to those standards had arrived. This unsatisfactory phase of the matter is well illustrated by the quantity of wheat exported prior to fixing the F.A.Q. Standard during the present year: it could not be fixed until nearly the middle of February. At that date 4,827,597 bushels, or 41 per cent. of the total exported to the end of July, had been shipped, and by the time the sample was received in Great Britain this had increased to 63 per cent.

The real position is that, prior to the receipt in Great Britain of the F.A.Q. Standard sample, buyers are to some extent "buying a pig in a poke," and trading in our wheat is only possible because past experience has taught them, within limits, what to expect. There is, however, a certain amount of uncertainty about the quality, for which a suitable, and no doubt a conservative, margin must be provided.

Overseas buyers are undoubtedly seriously inconvenienced by this drawback, which is unavoidably associated with an F.A.Q. Standard. The inevitable delay is a very probable source of friction between buyer and seller, and it is reasonable to assume that this inconvenience is reflected in the price paid by the buyers for our grain, and that in consequence the grower does not receive its full value, or the higher price which could be paid if the risks now inseparable from trading under the present F.A.Q. Standard were decreased, as they can be.

The second defect cannot be overcome by any adjustment or elaboration of the F.A.Q. Standard, as can the first one, but it can be overcome by a change from a variable, as at present, to a fixed or permanent standard or standards. Though it would not have been possible to have a fixed, or permanent, trading standard when the F.A.Q. system was first adopted in Australia, or indeed when the system was adopted at a much later date in Western Australia, it is now possible to have such a standard. Since the time when the F.A.Q. Standard was adopted a great deal has been learned about our wheat. The varieties now in general cultivation, even throughout Australia, conform very largely to one distinct type. With obviously "smutted" or other inferior parcels, rejected and kept distinct as is done at present, the colour and soundness of Australian normally grown grain are similar in any year, and there are only very

slight differences in the quantity of smut and other foreign matter present. According to past experience this may be set down at about 3 per cent. for Western Australia and 4.3 per cent. for the Commonwealth.

It is true that the weight per measured bushel of the F.A.Q. Standard *does vary* from year to year. Since 1910 the range throughout Australia has been from 56¾ lbs. to 64½ lbs., but if the millable grain only were standardised the variation would be within narrow limits. Granting, however, a wider range in the variation between measured bushel weights from year to year, the differences in this respect could be met by requiring that the weight of a fixed standard corresponding to the present F.A.Q. Standard shall not fall below a certain minimum, say, 61 lbs., and then following the practice of dealing with each cargo according to its own bushel weight, as is the practice in connection with the sale of, say, "Rosafe" wheat. With this wheat the bushel weight of each cargo is ascertained at the time of shipment, and influences the price at which it is sold. The heavier quality brings the better price; thus, other conditions being equal, "Rosafe" wheat with a bushel weight of 63 lbs. (quoted "Rosafe" 63 lbs.) would realise more than "Rosafe" 62 lbs.

It is stated to be an axiom of successful business administration that the buyer is to be supplied with what he wants if this can be reasonably done. Our overseas buyers have already stated in no uncertain terms that they desire to know, *at the time of purchase,* the quality of the wheat they are buying. As already pointed out this cannot be done with a variable F.A.Q. Standard, but can be readily achieved *now* by means of a fixed standard. Why not, therefore, give our buyers what they are asking for.

There is nothing unusual in having a fixed standard. The great exporting countries of Canada and the United Staets of America have them, and it is recognised to their advantages. Geographically Canada and the United States of America are more conveniently situated to the great wheat consuming centres than Australia, and yet both have found it imperative and advantageous to adopt and market their wheat according to a system of permanent standards ("grades"). Further, because of the greater diversity of types and varieties, these countries had far more initial difficulties to overcome in deciding what these permanent standards ("grades") should be, then Australia will have. The difficulties which both these countries had in deciding what permanent standards ("grades") to adopt, and the number they are compelled to have, may possibly have caused some people to hesitate to advocate the adoption of permanent standards in Australia.

There is, further, no wheat exporting country in the world which lends itself to the adoption of permanent standards under easier or more economic conditions than Australia. All the wheat States grow the same class of wheat under practically the same conditions, and the exportable surplus of each State is usually sold under the definition f.a.q. Thus a standardisation system suitable for one State would be suitable for all States. There would be nothing revolutionary in making a change in our system; it would simply be an ordinary evolutionary phase of our development. If we needed it, there is quite a recent precedent for making the change suggested. Until 1923 certain types of both red and white wheat (when mixed together known as "Walla Walla") were exported from the Pacific Coast of North America, and dealt with on the basis of an F.A.Q. Standard. In that year the variable standard was changed to fixed ones, and the term "No 2 Western White" is now given to what was previously known as "White Walla," and "No. 2 Western Red" is now applied to the description hitherto known as "Red Walla."

It may be thought that, because our wheat is in bags, it is impossible to deal with it according to fixed standards. This is not so. This idea has probably arisen because of a very general belief, in which the writer shared, that bulk grain is always cleaned from screenings and foreign matter on being received from the farmer or before despatch overseas. Bulk wheat, and the facilities at elevators enable this to be done, but the practice is anything but general. Except that bulk wheat can be sampled rather more readily than bagged wheat the procedure under a system of permanent standards would be the same with bagged as with bulk wheat and would present no greater difficulty.

This year Government certificates were required in connection with the sale of some early wheat cargoes, and as the F.A.Q. Standard had not been fixed, it was agreed to issue certificates for "Western Australian Standard White," the quality to be similar to that of the f.a.q. for the past five years, the declaration regarding which was almost identical with the elaborated description of the present season's F.A.Q. Standard already given.

Bagged Wheat—like Bulk Wheat—can be Standardised.

The W.A. Standard White was in effect a permanent standard, and the merchants had no more difficulty in handling these cargoes under it than in handling similar certificated cargoes later under the F.A.Q. Standard. The amount of wheat exported under this W.A. Standard was approximately 1¾ million bushels, an amount equal to 35 per cent. of the total quantity exported prior to the fixing of the F.A.Q. Standard. If further evidence is needed it is furnished by the experience with some 30,000 tons of New South Wales wheat sent to America during the war period. These cargoes, though in bags, and dealt with in Australia in accordance with the F.A.Q. Standard

had to be handled and distributed on arrival according to the American permanent standards ("grades"). The work of dealing with our bagged wheat according to permanent standards has, therefore, been carried out in America, and according to a similar standard in Western Australia, without trouble or difficulty. There is thus no foundation for the belief that it is impossible or difficult to deal with our Australian bagged wheat according to fixed standards. It has been done.

The making of the change suggested would in no way interfere with or disorganise existing methods of dealing with the grain crop. The present method of buying from farmers by sample, and according to the judgment of the agent, could continue; but, because of an accurate definition of what the standard consists, the adjustment of differences in case of disputes either overseas or in the State, could be settled by skilled judgment assisted by simple and accurate tests instead of, as at present, by personal though skilled judgment only. An instance of the need, on occasion, of using the screen and scale to supplement experience and skill was furnished during the inspection of a certificated cargo. It was claimed that a particular parcel of wheat was superior to the F.A.Q. Standard. A sample of the wheat in dispute was then divided into its component parts with the results hereunder, and with which, for comparative purposes, are given also similar details regarding the F.A.Q. Standard. These are—

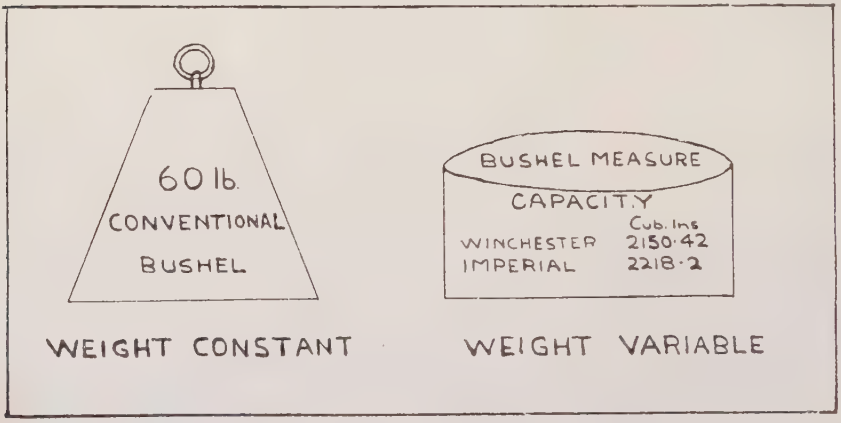
	Sound grain per cent.	Red grain per cent.	Broken grain per cent.	Chaff and Foreign matter per cent.	Bunt per cent.
F.A.Q.	95·89	·70	2·60	·80	·01
Commercial parcel	95·69	·85	2·13	1·26	·07

It is obvious from, and was admitted after, a comparison of these results that the parcel in dispute was not only not superior, but was not quite equal to the F.A.Q. Standard. The quality of these two samples was so nearly equal that to determine their relative value by means of an examination only, however skilled the judgment of the examiner, was impossible.

British merchants are fully aware of the advantages of permanent standards, and of the serious disadvantages of the present F.A.Q. system. In this connection Mr. J. H. Rickard, representing Messrs. W. Gilling & Co., London, stated in June, 1926, that in his opinion it would be more beneficial, not only to Western Australia but to the whole of the Commonwealth, if a fixed standard of quality was introduced. It would enable merchants in importing countries to bid for Australian wheat knowing the quality and condition of the grain they were purchasing prior to, and not after, the contracts were made. "How much better it would be," he said, "in these days of keen competition to have a definite and permanent classification for Australian wheat than the present F.A.Q. system which is constantly changing from year to year. Such a standard would be known throughout the world, and would provide for a minimum test weight per bushel, dirt and foreign substances, and a maximum amount of moisture."

A Press report of a recent interview which the Hon. Minister for Agriculture in New South Wales, when in England, had with the millers, shows that they fear that if permanent standards were adopted in Australia they would lose the right which they possess under the present standards to submit claims to arbitration. That, however, would not be the case, and the adoption of a more definite standard would lessen the need for arbitration. It is believed that the principal obstacles to the proposed change are the fears referred to, and the usual disinclination to interfere with an established custom.

The two objections, already mentioned, to the F.A.Q. Standard are those which, though they indirectly affect the grower, are also of direct concern to the commercial community. From the growers' standpoint, however, another very serious objection to the present F.A.Q. Trading Standard is that "payment for quality" only partially operates. It is true that deductions are made for parcels which are below the F.A.Q. Standard, but rarely are premiums given for wheat above the F.A.Q. Standard, except for special varieties of exceptional baking quality for local use. It is claimed by some that the grower who produces an extra good or clean sample does obtain a premium for quality because the weight of a measured bushel of the better wheat weighs, say, 65 lbs. as against, say, 62 lbs. of the F.A.Q. sample, and conse-



Australian Wheat is sold by Weight, not by Measure.

quently the grower of the prime sample receives a premium equal to the value of 3 lbs. of wheat, or 3d. per bushel if the wheat of the F.A.Q. Standard were worth, say, 5s. 2d. This argument would be sound if Australian wheat were sold by *measure,* and not by weight, and it has a certain semblance to soundness because the name of the unit of "weight" by which wheat is sold, viz., "bushel" is the same as a well known measure of capacity which holds about 60 lbs. of wheat. Australian wheat is, however, *not* sold by measure, but by weight, and in this connection the term "bushel" is purely a conventional one and means a weight of 60 lbs. To sell a "bushel" of wheat in Western Australia, or in Australia, means, therefore, to sell 60 lbs. If this unit of weight were known as "sextal" instead of "bushel," just as 100 lbs. is known as "cental," then the confusion as to "measured" bushel and conventional "bushel" would not arise.

The present method does not provide the necessary inducement for the grower to remove from the wheat intended for market as much of the unmill-

able material as is practicable, but rather it encourages him to do otherwise, and, in consequence, there is a far larger amount included with the millable grain than is necessary. This is unsound, and the loss to each farmer is appreciable. Excluding bags, agents' fees, labour of stacking, and the face value of the unmillable material, screenings, etc., for which the buyer may or may not pay, it is estimated that the loss to the individual wheat farmer producing, say, 1,200 bags of wheat for transport alone is about £8. The aggregate loss to the Commonwealth and State is very great.

During the season 1924-25, the latest for which final figures regarding the Australian harvest are available, the wheat exported amounted to 62,122,800 centals. From investigations carried out by Scott and Winslow in 1917 it is estimated that the average percentage of unmillable material in the commercial wheat of Australia was 4.35. Using this figure it is found that the total quantity of unmillable material in the grain exported amounted to 120,640 tons. The estimated total expenditure involved in transporting this unmillable material from the farm to the port and overseas markets is—

	£
Cartage—120,640 tons at 5s.	30,160
Railway freight—120,640 tons at 12s.	72,384
Sea Carriage—120,640 tons at 40s.	241,280
	£343,824

Calculated in a similar way the loss in connection with handling the same material in Western Australia, on a basis of 3 per cent. (the amount of unmillable material found in the Western Australian F.A.Q. Standard) is—

	£
Cartage—12,042 tons at 5s.	3,010
Railway freight—12,042 tons at 12s.	7,225
Sea Carriage—12,042 tons at 40s.	24,084
	£34,319

It may be thought that the fixing or altering of trading standards is a matter that does not concern the wheat grower, as wheat for shipment overseas has passed out of his hands into the hands of the local wheat merchants. Such an idea is entirely erroneous. On reflection it will be realised that the price the local wheat merchant can pay the grower is determined by the price obtained overseas, less the deductions necessary for unknown contingencies, such as legal costs due to friction, etc., as well as for the known and ascertained costs of transport and distribution.

Though this question of trading standards is one in which the growers are very intimately, and, when low prices rule, vitally concerned, they have been too busy about the production of wheat in the pioneering stages to find time to be interested in this marketing problem. Some idea as to how difficult, and how almost hopeless, their initial and main problem was considered not much more than a quarter of a century ago my be judged by a reference to it in the Presidential Address by Sir Wm. Crookes on "The Wheat Problem" to the British Association for the Advancement of Science at Bristol in 1898. He said: "For the second season in succession the wheat crop last

year was destroyed over large areas in Victoria; and in South Australia the harvest averaged not more than about 3¾ bushels per acre after meeting colonial requirements for food and seed, leaving only 684,000 bushels for export. In most other districts the yield falls to such an extent as to cause Europeans to wonder why the pursuit of wheat-raising is continued."

To understand to what extent wheat growers have succeeded it is only necessary to note the progress made in the quantity of Australian wheat produced during the present century. The area under wheat for grain in Australia in the seasons 1900/1 and 1924/25 was, respectively, 5,666,000 and 10,807,000 acres, an increase of 109 per cent.; the production for the same years was 48,353,000 and 164,544,000 bushels, respectively. The pro-

A Determination with Sieve and Scale.

gress made in Western Australia is even more striking. In the same years the areas were 74,000 and 1,867,000 acres, respectively, and the production 774,000 and 23,887,000 bushels. This achievement shows that, as a class, our wheat growers are progressive, and are not slow to adapt themselves to improved methods of cultivation. It is reasonable to expect, therefore, that if this question of an amendment of our trading standards rested entirely with them, they would not be less progressive in adopting new and improved standards for marketing their crop. In this matter their interests are closely associated with those of millers and wheat exporters, whose co-operation, judged by past experience, they have reason to anticipate.

The fact that "payment for quality" only partly operates is indirectly bad from the national standpoint, and is a serious economic loss, for it tends to keep the trading standard lower that it might be. In consequence, the price for Australian wheat is less than it should be, for it is a well known fact that the price wheat will command is, like any other commodity, influenced by its quality. Though an indirect loss, this is a real one, as is disclosed by sales made during some period of almost any year under comparable conditions when a cargo from one State, with a slightly lower standard, will realise

3d. or more per quarter less than a cargo from another State. Even when the market is so dull that a premium cannot be obtained, the wheat from a State having a higher standard will always receive a "preference" over wheat from a State with a lower standard, and is proof that the overseas buyer is willing to "pay for quality," and is a very solid argument in favour of changing to a system which will encourage the production of a crop of even higher quality than is possible with the present F.A.Q. Standard.

Quality is to some extent governed by weather conditions, over which the farmer has no control, and such variations must be provided for by different standards. On the other hand, it is also affected by the amount of unmillable material contained in the wheat, and as this is governed by the care and skill used in harvesting the crop, much may be done by the farmer himself to improve the quality of our wheat.

Sampling Bagged Wheat.

This omission to "pay for quality" is certainly not equitable; is not in keeping with the spirit of the times; and is detrimental to the progress of the industry, in that it provides no inducement for the grower to improve the quality of his product for market, and to clean it to the extent it is practicable for him to do. Rather is the reverse the case, and in consequence the "screenings" sieve in some cases is replaced with a plain sheet, or removed.

It is not suggested that the whole of the unmillable material now present in the F.A.Q. Standard could or should be removed, because, owing to our method of harvesting the grain from the standing matured crop in the field, there are practical difficulties in the way of securing a perfectly cleaned sam-

ple except at greater cost than the value of the benefits to be derived. It is certain, however, that with the necessary inducement the quantity could be reduced very considerably, probably by 60 or 70 per cent.

This third defect associated with the F.A.Q. Standard can be remedied, and "payment for quality" can be ensured to a greater extent than at present by providing that the standard shall specify the maximum quantity of unmillable material the wheat may contain, or it may be ensured completely by providing that the standard shall refer to the millable grain only, as is the case with the Canadian standards ("grades"). The latter plan is in line with the method of trading in cream and wool. In the case of cream, its value

Determining the "Standard" of Bagged Wheat.

is based upon the amount of butter fat it contains; in the case of wool, upon the yield of clean scoured wool which can be obtained from the greasy product.

From what has been stated it will be seen that the defects associated with the F.A.Q. Standard are—

(1) It is not definite enough.
(2) It cannot be fixed early enough.
(3) It is not equitable enough, and offers no inducement for the maintenance or improvement of the quality of Australian wheat.

As has been shown the first of these can be remedied by an elaboration of the present declaration regarding the F.A.Q. Standard; the second by having one or more fixed or permanent standards; and the third, to a limited extent, by the adoption of standards, either an elaborated f.a.q. one or per-

manent ones, which provide for the payment of a limited quantity of unmillable material, or completely by the adoption of standards which provide for payment for the millable grain only.

Some change is, obviously, desirable. The change to remedy all defects must be one which will include the adoption of permanent standards. It is, therefore, suggested that, when the change is made it should be in this direction, for it is believed that the difficulties inseparable from all changes will be no greater with the change giving the maximum advantage than with the one giving the least.

The wheat trade has become accustomed to the present method, and care must therefore be used to see that any change is made with discrimination. The change considered necessary to meet all requirements means the adoption of three standards instead of two as at present, the standard under which most of the trading will be done to be almost identical with the present f.a.q., but having regard to the amount of unmillable material it contains.

Whilst not generally recognised, there are at present in Australia two trading standards, viz., the f.a.q. and a standard for the type having specially valuable baking qualities, and which includes such varieties as "Comeback," "Bobs," and "Carrabin." This latter does not change from year to year, and is therefore permanent, though probably few realise this. A decided advantage to the present system would be to make permanent both the present standards, thus involving the very slightest of changes, but it is believed that the modern requirements of our expanding wheat trade demand the inclusion of another standard slightly inferior in quality to the present f.a.q. This additional standard would not involve any very drastic changes. Apart from the "smutted" wheat which at present is kept separate, it would involve the keeping of three standards separate instead of two, as at present. The benefits accruing to all parties from the change would far outweigh the additional trouble involved.

A little over four years ago attention was drawn to the probability that the State of New South Wales, which had introduced bulk handling, would require to introduce new standards for selling the wheat crop. The necessity for doing this has become apparent, and recent cables advised that the New South Wales Minister for Agriculture, then in Great Britain, had decided after consultation with representative millers in Liverpool (England) to introduce permanent standards for dealing with the crop of that State.

The action of New South Wales may precipitate action by other States, for though each State fixes its own F.A.Q. Standard, it is well known that wheat from any of the States is bought on an Australian basis. The time is very opportune, therefore, to consider the terms to be used in connection with the new standards, and the quality of the wheat included in each.

Though the wheat grower is the one most concerned financially in the fixing of commercial trading standards for the sale of his crop, millers and wheat merchants are also interested. It is, therefore considered desirable that they, as well as the grower—because changes in established methods should be made with discrimination—ought to be consulted before the details of any standards are finally decided upon. With the object of assisting those who may eventually be called upon to deal with this matter, some suggestion regarding proposed standards, their designation and characteristics, are submitted for consideration and as a basis for criticism.

It is suggested that the terms to be used in connection with the standards should—

(1) Denote their Australian origin.

(2) Be descriptive and simple.

(3) Be distinctive.

It is believed that these requirements can be readily met in the terms to be chosen.

Australian wheat, the world over, has achieved a reputation for the whiteness and brightness of its berry, because of the beautiful rich white flour which can be produced from such grain, and which is so suitable for blending purposes. In view of our ideal of a "White Australia," such a reputation is a very fitting one. "Australian White" is, therefore, a term which combines the distinctiveness of the country of origin and the much sought attribute of colour. Commercial reasons demand that any term describing Australian wheat should strongly emphasise its whiteness. Though there are a great number of varieties grown in Australia, the grain produced by all the States would, with the exception of a negligible and rapidly decreasing number of varieties with red berries, be included in this term. It is, therefore, suggested that the term "Australian White" should be used in connection with all the standards adopted in Australia.

Though an unnecessarily large number of varieties may be grown throughout the wheat belt of Australia, the type is, owing to the similarity of climate, fortunately very uniform, and the main difference between normally grown Australian wheat is one of brightness. Because of our fortunate position in this respect there is not the need for the same number of trading standards as in other countries. In view of the similarity of type it is considered that Australian requirements would be met by having two standards for the main type of wheat grown, the distinguishing feature between them being that of brightness. As the bulk of our preesnt F.A.Q. Standard wheat would be included in the better of the two standards, such wheat should have the higher classification, and, if the terminology of the United States of America and Canada be adopted, it would be known as "No. 1." Because of its proposed similarity to the quality of the F.A.Q. Standard, and as an additional distinction, the terms "Standard" might be used instead of the designation "No. 1." The two standards would then be known as—

"Australian Standard White," and

"Australian White," or "No. 2 Australian White."

Though there is a great similarity among Australian wheats, there are a few varieties like "Comeback," "Minister," "Bobs," Carrabin," etc., which are superior in baking qualities to the others, and may be considered as a separate type. They are so regarded at the present time, and are invariably sold separately at a premium on the f.a.q. price. Such varieties at present constitute only a very small proportion of the total crop, probably not 5 per cent., and this is all absorbed in local mills. Although the quantity is limited, however, it is anticipated that the proportion will increase, and, in any case, it is essential in the interests of the growers and of the Commonwealth that these varieties should be placed in a standard by themselves. As they represent the best of our wheat they could very appropriately be described as "No. 1," although such a term is not considered descriptive enough for this wheat of superior milling quality, as it does not indicate to the trade in what respect

the distinction is made; and further, the adoption of the term "No. 1" for this type might prejudiciously affect by implication the commercial value of that standard of which there is the greatest quantity available for export, and which it is suggested should be called "Australian Standard White."

There are two terms, either of which would describe the special characteristics of this class of wheat. These are "Hard" and "Strong." In Canada the term "Hard" is used in connection with the best Canadian milling wheat, which is known as "Canadian Hard Red." Because of the good reputation which this class of Canadian wheat has earned, there is a tendency on the part of some people to apply the term "Hard" to the best class of Australian wheat. This is not desirable because, in the wheat trade, the word "Hard" has a unique Canadian association with the word "Red."

From the Australian standpoint any suggestion, however faint, of the word "Red" with our wheat is particularly objectionable and likely to lower its commercial value. Such an association infers a departure from the distinct characteristic for which Australian wheat and flour are noted, viz., their brightness and whiteness. The term "Hard" has also a tendency to create an unfavourable impression on the mind of the miller, for it implies difficulty in connection with milling operations.

None of the objections referred to applies to the use of the word "Strong." It was the word used by Farrer in the early days of wheat improvement to denote his ideal of the new varieties he was producing. It is now in use in Australia where it has the same meaning in the milling world that "Hard" has in America and Canada. It has no association with the term "Red"; it is distinctive and because of its association with the much desired baking quality "Strength" describes at once to the miller the character of the flour produced from such wheat without creating any impression of milling difficulty. It is considered fitting, therefore, that the word "strong" should be applied to the standard for wheat of this type.

As varieties of this type of wheat are our best, and are sold locally at a premium, it is not unfitting that the word "Premier" be attached to the "Standard" embracing them. It is suggested, therefore, that the term to be used for this highest type of Australian wheat should be "Australian Premier Strong White." For this type one grade only would be required, and the term "Australian Premier Strong White," without any distinguishing number, would be quite sufficient for it.

Table II. herewith provides some interesting information regarding the botanical fractions which go to make up the F.A.Q. Standard. The details for the year 1917, and the two preceding it, were prepared by Messrs. Scott and Winslow, of the Victorian Department of Agriculture, and these of later years by Mr. N. J. Davenport, of the Wheat Branch of this Department.

From these results it will be seen that during the years for which figures are available the amount of red grain is negligible. The percentage of weed seeds and grain other than wheat was less than ½ per cent. in all years except that of 1922, and even on this occasion it only exceeded this percentage by .08 per cent. It is, therefore, reasonable to expect that any standard for our wheat should not contain more than ½ per cent. of these materials. Further, the quantity of bleached and unsound grain did not reach .4 per cent.

TABLE II.

RESULTS OF MECHANICAL ANALYSES OF THE F.A.Q. STANDARD.

Total weight 1,000 grammes.

F.A.Q. Sample.	Bushel weight.	FOREIGN MATTER.										Screenings.	Total Dockage.	MILLABLE GRAIN.				
		Barley.	Oats.	Wild Oats.	Drake.	Other Weed seeds.	Total weed seeds and other grain.	Bunt.	Chaff.	Backbone and other debris.	Total.			Unsound and Bleached.	Red.	Broken.	Bright and Sound.	Total.
1914 ...	61	1·02	·47	·04	·81	·02	2·36	·50	1·70	1·58	6·14	14·5	20·64	...	...	...	...	979·36
1916 ...	60½	2·32	·59	...	1·26	·05	4·22	·04	4·89	·65	9·80	42·0	51·80	...	...	...	...	948·20
1917 ...	62½	2·67	·31	·06	1·46	·04	4·54	·09	3·02	·40	8·05	21·0	29·05	...	...	...	...	970·95
1922 ...	63	2·47	·53	...	1·91	·17	5·08	·40	1·18	2·38	9·04	17·75	26·79	...	...	...	...	973·21
1923 ...	62	1·55	...	...	·95	...	2·45	·10	·75	·65	4·00	25·1	29·1	...	...	...	...	970·90
1924 ...	62¾	...	...	...	...	...	...	·25	·74	7·78	8·77	15·5	24·27	1·0	2·13	9·1	959·1	975·73
1925 ...	62½	2·10	·28	·06	·81	·65	3·90	·55	3·13	3·20	10·78	19·25	30·03	3·61	1·89	8·13	956·34	969·97
1926 ...	62	1·45	·17	·03	·88	·02	2·55	·55	2·95	2·42	8·47	20·25	28·72	2·80	·80	5·50	962·18	971·28

All above weights are in grammes.

The three standards suggested might conform, therefore, to the following descriptions:—

"AUSTRALIAN PREMIER STRONG WHITE."

"Australian Premier Strong White" shall be dry and undamaged by moisture. It shall be free from weevils or other insects, and from smutty, musty, or other commercially objectionable smell.

Of the millable grain there shall not be less than 95 per cent. of sound, bright milling grain, which shall be translucent or horny in character, and the other grain shall be sound and unbleached.

Of the foreign matter present the percentage by count of the unbroken smut balls present shall not exceed one-fifth per cent. of the millable grain, and there shall not be more than one-half per cent. of weed seeds and other grains. The weight per bushel of the millable grain (dockage free) shall not be less than 63 lbs.

"AUSTRALIAN STANDARD WHITE."

"Australian Standard White" shall be dry and undamaged by moisture. It shall be free from weevils or other insects, and from smutty, musty or other commercially objectionable smell.

Of the millable grain there shall not be less than 98.5 per cent. white, sound, bright grain, and of the other grain there shall not be more than one-half per cent. of bleached grain.

Of the foreign matter the percentage by count of the unbroken smut balls shall not exceed one-fifth per cent. of the millable grain, and there shall not be more than one-half per cent. of weed seeds and other grains. The weight per bushel of the millable grain (dockage free) shall not be less than 62 lbs.

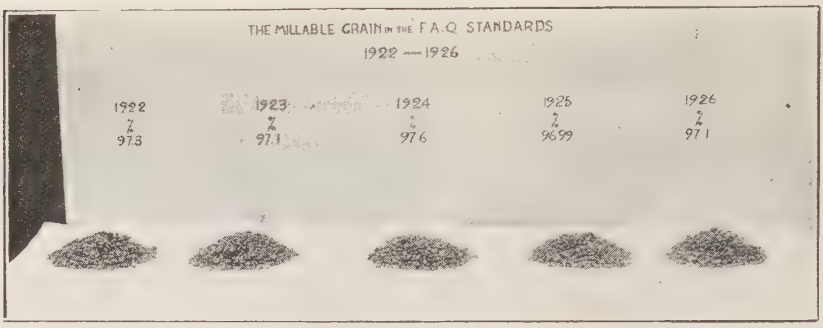
"AUSTRALIAN WHITE" OR "NO. 2 AUSTRALIAN WHITE."

"Australian White," or "No. 2 Australian White," shall be dry and undamaged by moisture. It shall be free from weevils or other insects, and from smutty, musty, or other commercially objectionable smell.

Of the millable grain there shall not be less than 80 per cent. white, sound, bright grain, and of the other grain there shall not be more than 1 per cent. of bleached grain, nor more than 1 per cent. of other unsound grain.

Of the foreign matter the percentage by count of the unbroken smut balls shall not exceed one-fifth per cent. of the millable grain, and there shall not be more than one-half per cent. of weed seeds and other grains. The weight per bushel of the millable grain (dockage free) shall not be less than 58 lbs.

As already shown, the bushel weight under certain conditions is an index to the milling value. These conditions are met in the details prescribed for the different standards. The information regarding the bushel weight has, therefore, a far greater value as an index to quality than when given in connection with the present F.A.Q. Standard. It is, therefore, important and desirable that the weight per bushel should be included in the details regarding the standard of any particular parcel of wheat for sale. This can be readily done by including with the standard name the bushel weight of the particular parcel. Thus, a parcel of wheat conforming to the standard set up for "Australian Standard White," weighing 64 lbs. per bushel would be commercially known as "Australian Standard White, 64 lbs." The standards proposed, therefore, are elastic enough to enable the wheat of a State or district to be bulked and sold under a common bushel weight, or for individual parcels to be sold according to their own bushel weight.



Normal W.A. Commercial Wheat contains about 97% Millable Grain, of which nearly 99% is sound and bright.

All standards would have corresponding "smutted standards," just as at present, under the F.A.Q. Standard, smutted grain is kept distinct from the unsmutted; such standards would conform to the other requirements with the exception that they would be "smutted" and have this word appended to the Standard name.

It will be noted that "Australian Standard White" corresponds very closely to the suggested elaboration of the F.A.Q. Standard. Such a standard would, in effect, be a fixed "Fair Average Quality" standard for all years, instead of, as at present, a slightly variable one for every year, which entails much trouble and has at least two very decided disadvantages without any compensating advantages.

No standard is suggested for wheat of a quality inferior to "Australian White." It is not considered advisable to have a permanent grade for wheat of inferior quality, as such would not be normal Australian wheat. From time to time this class of wheat will have to be dealt with as was done in Western Australia in 1915-16 when portion of the crop, because of rust, had to be dealt with separately, and was placed in a separate pool known as No. 2. Canada deals with a similar situation in the same way as the occasion arises by creating what are known as commercial standards ("grades") for wheat which does not conform to the statutory grades.

The adoption of new trading standards will involve the introduction of recognised and systematic methods of sampling and, probably, of the use of terms with which all those accustomed to the existing method may not be familiar. As an essential feature of the description of a trading standard must be that it is understandable, it is necessary that the methods adopted and the terms used should be properly defined. As an aid in this direction the following schedule is submitted:—

Methods of taking Samples and determining Foreign Matter, etc.

Sampling.—A running sample shall consist of not less than half an ounce per bag and shall be duly representative of the bulk of the parcel being inspected. This shall be thoroughly mixed and 4 lbs. taken for the purpose of examination by means of appropriate sieves or other approved mechanical means.

Foreign Matter.—Foreign matter shall mean sand, dirt, weed seeds, wheat stems, chaff, backbone, straw, and grain other than millable wheat grains.

Screenings.—Screenings shall be the small shrivelled and broken grains which pass through a sieve having rectilinear opening 2 mm. wide.

Dockage.—Dockage shall include the foreign matter and screenings which can be removed readily from the commercial wheat by means of sieves, cleaning device, or other practical means suitable for the purpose.

Weight per Bushel.—The weight per bushel shall be determined by an approved standard chrondrometer and shall be the weight of the running sample.

Determination of Foreign Matter and Screenings.—The bushel weight and the percentage of foreign matter and screenings shall be calculated in the terms of percentage based on the total weight of the sample, which includes millable grain, foreign matter, and screenings. All other determinations shall be upon the basis of the grain when freed from foreign matter and screenings.

Just as the F.A.Q. system supplanted a less suitable one, so it is believed that, because of our greater expansion, it is now desirable that our present F.A.Q. Standard, which has served its turn, should give place to a more modern one of trading according to permanent standards, a system which is more in keeping with the march of standardisation, and which will bring the Australian system in line with the other great wheat producing countries of Canada and the United States of America.

The advantages of permanent trading standards in connection with the wheat trade are summed up very concisely in the report of the Secretary of the United States Department of Agriculture for 1924, who, after several years' experience with it in the United States of America, wrote: "Federal grain standardisation by establishing a uniform basis for interstate trading, lessens the chances of misunderstandings and disputes, gives confidence to buyers and sellers, and facilitates business at every stage in the movement of grain from the farm to consuming centres. It thus tends to reduce distribution costs, and reduction of distribution costs is of practical value to the farmer at any time. It is especially useful to him in times of low prices when inefficient distribution may saddle him with an intolerable burden of expense."

Money.

Money is the article or articles agreed upon as a common denomination of value, in terms of which all commodities may be expressed, with a commensurate amount of which any commodity may be purchased, for a commensurate amount of which any commodity may be sold.

THE SOWING OF SMALL SEEDS UNDER FIELD CONDITIONS.

G. K. BARON-HAY, B.Sc. (Agri.),
Agricultural Adviser.

All farmers who have made a practice of growing such crops as Sudan grass, lucerne, rape, etc., under field conditions have probably experienced, at one time or another, disappointing results due to partial and irregular germination of the seed.

The requirements of a plant for successful germination, namely, warmth, moisture, aeration, and available plant food, are so well known that there is no need to stress their importance. The writer has noticed, however, during the last four years that, even where these conditions are apparently satisfied, disappointing results have ensued, particularly on light soils, and with spring sown crops, Sudan grass, Lucerne, or a catch crop, such as rape.

The almost invariable practice in sowing the seeds of the above and similar crops is to sow the seed as near the surface as possible. Many farmers broadcast these seeds on the cultivated soil, only covering the seed lightly with a brush harrow. The possibility that *depth of planting* was a limiting factor to successful germination on certain types of soils, was first brought under the notice of the writer by Mr. M. House, Gnowangerup, some four years ago. This farmer has been very successful for some years in the spring planting of Lucerne, and his invariable practice is to sow the seed deeply, down to as much as three inches on light soils, but generally two inches deep on well prepared fallow.

Similar results have since been attained by other farmers using this method.

Last summer Mr. E. Watts, "Westwood," Wandering, arranged to carry out an experiment with a Rape crop to endeavour to determine the relative merits of deep and shallow planting on the light soils in that district.

The following are the particulars of the demonstration carried out:—

Soil—Second class light loam to gravelly loam carrying originally Wandoo (White Gum, *E. redunca var. elata*) and Blackbutt (*E. patens*).

Ploughed—August, 1925, for fallow.

Cultivated—Previous to sowing, in March.

Sown—March 4th.

Seed per acre—2 lbs. of Dwarf Essex Rape and 50 lbs Calcutta Oats per acre.

Fertiliser—90 lbs. superphosphate, new seasons.

Total area planted with Rape—60 acres. The seed was measured and mixed with the fertiliser as required.

Seeds were planted at depths of two inches, as shallow as possible (approximately half inch), and on the surface.

The growth, as seen in the illustrations, was very even and vigorous all over the area where the seed had been planted two inches deep, the shallow and surface sown seed being very patchy and not as vigorous as the surrounding area. This is shown in the illustration. The photos were taken on 24th May last, 81 days after sowing.

Showing influence of shallow seeding.

A. Plot sown half inch deep, running through to timber in background.

Table 1 sets out the rainfall, together with the maximum and minimum temperatures, in seven day periods, starting with March 5th, the date of the commencement of the experiment.

It will be noticed that the day temperatures were high and suitable for the growth of this crop, while the night temperatures fell considerably, and during May frosty conditions prevailed. The growing period was short, therefore, and the results obtained remarkably good.

TABLE I.

Weekly Rainfall and Temperature during Growing Period.

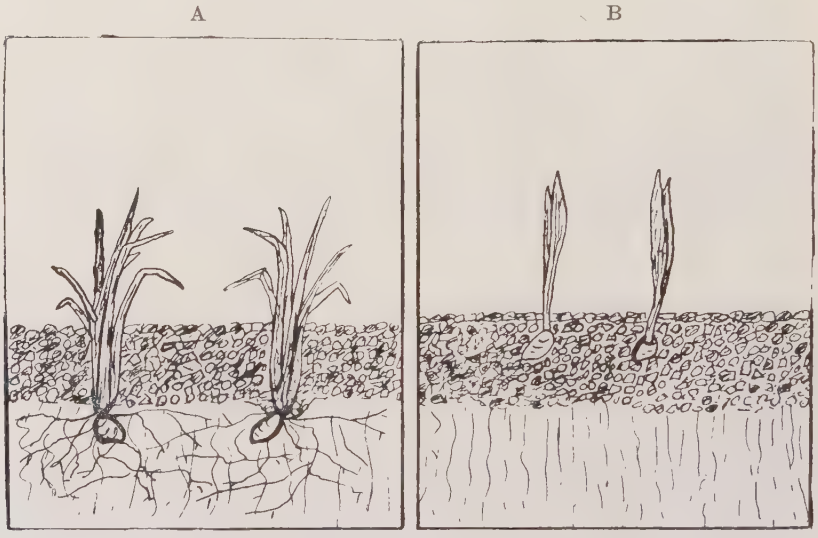
Week ending.		Rainfall.	Max. Temp.	Min. Temp.	Average Temp.
		points.			
March	11	88	79·0	50·8	64·9
,,	18	18	76·3	53·7	65·0
,,	25	...	78·8	53·1	65·9
April	1	117	75·1	54·1	64·6
,,	8	11	79·1	58·0	68·5
,,	15	29	75·9	51·3	63·6
,,	22	362	63·1	50·0	56·5
,,	29	91	65·1	44·0	54·5
May	6	31	68·0	41·3	54·6
,,	13	10	63·1	37·1	50·1
,,	20	165	65·5	49·2	57·3
,,	27	78	61·1	46·7	53·9

From the above and other similar observations, the writer believes that in the sowing of Lucerne, Sudan grass, and Rape in spring or during summer, deeper planting than is ordinarily practised would be beneficial, on loamy soils.

The reason for this, with a little reflection, will be obvious.

All these crops should be sown on well prepared fallow, which should possess a fine surface mulch.

In light soils this mulch is generally at least two inches thick and is dry. In order to obtain successful and rapid germination, it is necessary for seeds to be planted just below this mulch, and in contact with the damp undersoil. This is illustrated in the diagrams below.



Seed sown correct depth, below mulch, in contact with damp soil.

Seed sown too shallow, for good germination.

The moisture may be brought nearer the surface by rolling, but this destroys the effect of the fallow, and in the spring planting of seeds should not be carried out, *unless the soil is to be harrowed immediately after planting is completed.*

Effect of Superphosphate on Viability of Seeds.

With the type of drill almost invariably found on West Australian farms, the drilling of small seeds, such as Rape, Sudan, Lucerne, etc., presents some difficulty, the difficulty being to obtain a sufficiently thin and even distribution of the seed.

In order to secure this condition with the implement usually to hand, namely, the wheat drill, it is found necessary to mix the seed with some diluting material, which is run through the fertiliser box, the seed box being dispensed with for the time being.

This diluent may be an inert substance, such as sand, which would have no effect on the germinating capacity of the seeds. This necessitates, however, traversing the field again to apply the fertiliser, as a phosphatic manure is required for all crops in this State.

The practice is, therefore, to mix the seed to be sown with the desired fertiliser, say 3 lbs. of lucerne seed, 109 lbs. of superphosphate, and set the drill to sow 112 lbs. This would sow 3 lbs. of Lucerne per acre.

Results from sowing seeds in this manner have been far from uniform, and although the depth of planting may in some cases have been the disturbing cause, undoubtedly admixture with superphosphate has also produced its quota of failures.

Showing even character of growth of rape crop on area seeded 1½-2 inches deep.

Mr. W. R. Birks, Department of Agriculture, South Australia, where conditions are somewhat similar to this State, found that the resistance of the seeds of different plants to exposure to superphosphate varied.

It was found that Rape was far more liable to injury than Canary Grass or Lucerne.

The effect of superphosphate on seeds was found to be dependent on the *moisture content* of the manure, rather than on its acidity. A powdery free running dry superphosphate being more desirable for this reason than one containing more moisture, which is also liable to "stickiness" in the seed drill. (See Table II.)

Experiments carried out to test the effect of superphosphate on the viability of seeds allowed to lie in the manure for varying lengths of time gave

the following results. The superphosphate used in this instance contained 13.3 per cent. of moisture, which permitted it to run through the drill satisfactorily:—

TABLE II.

Superphosphate Sample.	Per cent. moisture.	Per cent. germination of seed after standing for—						
		4 hrs.	8 hrs.	12 hrs.	16 hrs.	20 hrs.	24 hrs.	Normal.
1	9·7	...	82	...	58	...	38	81
11	13·3	61	36	24	2	1	1	81

Where small seeds are to be mixed with superphosphate for the purpose of sowing, it is advisable therefore to mix them only as required and under no circumstances should seed be allowed to lie in the fertiliser for a longer period than four hours.

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THE SCIENTIFIC ASPECT OF THE PASTORAL INDUSTRY.

Hugh McCallum,
Sheep and Wool Inspector.

Western Australia, in its present stage, is essentially a community of primary producers.

Under existing conditions our secondary industries are of slow growth, as their development is not altogether within our control; but the primary production is within our control, and it behoves us to work on intelligent lines so that we make the best use of the great natural resources with which our State has been endowed. We must realise that we have a definite responsibility. It is not to be denied that in the field of production, whether it be wheat or whether it be wool, much more might be achieved. It is not sufficient to point proudly to the fact that as a State we have topped the twenty million mark in our production of wheat, nor to stress the fact that our aggregate production of wool is increasing by leaps and bounds, as will be seen from the following figures:—

Wool value.

1918-19—quantity, lbs., 29,644,556; value, £1,952,141.

1923-24—quantity, lbs., 43,875,108; value, £4,237,152.

Hides and skins value.

1918-19—£271,951. 1923-24—£520,248.

We must look more closely into matters and inquire as to the increase in the average yield per acre—the increase in the average poundage of wool per sheep. If the answers to these questions satisfy us, then all is well.

At the present time there is available a considerable amount of scientific and practical knowledge in regard to the breeding and feeding of sheep, but notwithstanding this, there is much wasted effort on the part of sheepmen, through working on unscientific lines. Many owners carry on thoughtlessly, without making an attempt to avail themselves of the knowledge that is to hand; others are conservative and are not open to suggestions that appear to challenge principles that have become fundamental to them. To remove this reproach we look confidently to the rising generation, who have been educated on sound scientific lines and are not hampered by tradition.

Amongst the most important subjects calling for scientific investigation are sheep husbandry and the growth of wool. Sheep stand alone in their ability to transform feed in quick time into an article of marketable value. The cultivation of fodder plants has not received the attention it deserves. More knowledge is required of our soils in relation to stock breeding. In this respect the sheepman is behind the wheat grower.

The scientist has made it possible for the wheat grower to carry on. Without superphosphate there would be no wheat industry in Western Australia to-day. The scientist was able to tell the farmer in what respect his soil was deficient in plant food and enable him to make good the deficiency. Our sheep on the wheat farms to-day are benefiting from the residual value of

the fertiliser, and thus our pastures are improving; but this is merely casual, and not the result of deliberate effort on the part of the sheep owner to improve his pastures; it, however, points the way. Already investigations are being made in the matter of top-dressing pastures, with promising results. In this connection a great advance will be made within the next few years.

Experiments are being carried on to assess the value of fodders that have given good results in other countries. Excellent results have been obtained, and it would appear that we will be able to lay down pastures that will revolutionise the prospect in some parts of our State. We still have much to learn in regard to the food value of our own grasses, and, above all, much has yet to be done by way of conserving fodder.

The proper feeding of stock is of the utmost importance, yet it is often neglected or is merely a casual business. Particularly in the dry period of the year is the closest attention required to the feeding of the ewe, so that its offspring may be well nourished and may have a chance to develop into a sturdy lamb. With the intelligent provision of a reserve of fodder much loss could be avoided. Not only should we strive to raise the percentage of increase in the flock, but we should see to it that the lambs when born have the vitality to carry on, and we can do this only by assuring that the breeding ewe has ample succulent feed. The best breeds of sheep can deteriorate with lack of proper nutrition. The more general use of silos would increase immensely the sheep raising capabilities of our wheat belt. In the southerly part of the State we have to face the long dry summer, and it is not to our credit that we have so long delayed in making proper preparations for this lean time. The more progressive farmers are now erecting silos, and it is safe to say that their value will be demonstrated quickly. We may thus hope to see the use of silos extending rapidly, for example is better than precept, and ocular demonstration is more potent with most of us than theoretical reasoning.

Again, in regard to the growth of wool there is room for research on the part of the scientific investigator. The study of the inheritance of certain characteristics in the fibre is a fascinating one, and it is to a great extent this study by its great flock masters that has made Australia pre-eminent in the production of quality wool. But the last word has not been said; there is no such thing as "marking time," and we may still go ahead. No other animal characteristics are so radically and seriously affected by environment as are those of the fleece. A scientific understanding of these things is urgently needed, and to our intelligent young sheepmen I could give no better advice than to study the methods and work of the men who have built up Australia's great flocks. The value of constitution in our flocks is first and foremost; any defect means deterioration—this deterioration may not be immediate, but the defect will assert itself even if it does so in the third or fourth generation. To produce perfection most careful selection is necessary, and the question of selecting and suitably mating is often neglected by sheep breeders, who should know better. In this matter of preserving the vitality and health of our flocks the matter of infestation from the widely distributed natural parasites so troublesome to sheep is of considerable importance. The scientific work already done in the study of the life histories of these parasites is one of the most valuable aids rendered by science to sheep husbandry. This is a State of vast dimensions; the climate of the north differs from that of the south; drought conditions may obtain in the north, whilst the south is unaffected. The immense distances make the organisation

of transport for starving stock a very difficult question, but it should be possible to do more than has been done in the past, to utilise the resources of the south to help the north to tide over its difficult time.

Some pastoralists have holdings in the south for their breeding ewes in time of stress, and this is a wise provision.

Above all, the greatest hope for the future lies in the scientific training of our young men in the breeding and in the subsequent nurture of sheep. The sheep industry has always appealed to the youth of Australia, but in a measure our boys can only take it up in a casual way, gleaning knowledge haphazardly as they go along. Many become excellent sheepmen after a long course in the rough school of experience; but if they started off with a sound scientific and technical training, much time would be saved and they would be none the less excellent sheepmen.

More might be undertaken by way of educating our farmers. The future prosperity of the wheat belt depends largely on the judicious interworking of wheat and sheep. Farmers find it necessary to have sheep on their farms to keep their fallow clean, quite apart from any profit that the sheep may bring; thus they are becoming sheepmen by accident, or rather by necessity. Many have had experience and do well, but others know nothing of sheep; they know little of the carrying capabilities of their land; serious losses are often made through this want of knowledge, and it is safe to say that the period in which the farmer is gaining knowledge is one of decided economic loss. It is the duty of the farmer who is running sheep to make use of the opportunities that are available for increasing his knowledge.

There is such a great scope for the extension of the pastoral industry in Western Australia, and such wealth would accrue to the State from its development, that the establishment of Research Bureau would repay over and over again the expenditure involved. There are many questions of vital interest to the industry that would claim the attention of the Bureau. All the disabilities that confront the sheep breeder would come within its purview. It would amass and distribute all available information, and it would be an authority to which all interested could turn.

The present holders of land in the State—whether they be pastoralists or farmers, whether their possessions are leasehold or freehold—are in a wide sense, trustees for the time being. They hold a position of trust in regard to the land, and with this position there is a measure of responsibility. It is the responsibility of each holder to see to it that his particular holding is managed in such a way that it is returning to the State a full measure of production. Casual methods will not do this, intelligent and earnest thought are required.

With the extension of knowledge in regard to sheep breeding there is no limit to the development of the industry in this great State.

MILK THISTLE.

(*Sonchus oleraceus*, Linn.)

W. M. CARNE, F.L.S., and C. A. GARDNER.

This plant is also known as Sow Thistle. It is a succulent annual herb of two to three feet in height with green or purple hollow stems, and dark green leaves, upon injury of which a thick, white milky sap is exuded, hence the name "Milk Thistle." The flowers are not unlike those of the true Dandelion and Flatweed, and are yellow.

The Milk Thistle has been recorded in this State since the earliest days of settlement, and it was collected in the Murchison and far South coastal districts before 1860. It has, therefore, been regarded as a native plant, but among its Australian relatives it appears rather out of place, possessing nothing peculiarly Australian, and it is also of almost cosmopolitan distribution. Considering its facilities for becoming disseminated by the air over large distances, it is not too much to expect that it is of introduced origin, even though it appeared here before the advent of the European. *Sonchus* is the Greek name used by Plinius for this plant (or a closely allied species), and the name *oleraceus* has reference to a pot-herb.

It should be borne in mind that the Milk Thistle is not a thistle in the usual sense of the term. It belongs to the same family as the Thistles, but is far removed from them within the family. It is neither spiny nor fibrous, and the flower heads will be seen to be very different from those of the plants which we know as thistles.

The Milk Thistle is a weed, particularly in gardens and orchards, and to some extent in cereal crops also, but it is not regarded as a serious weed. On the contrary it possesses some value as a food for stock, and is relished by them, particularly in the drier areas. Unlike many other plants of the same family Milk Thistle does not invade areas gregariously, it usually appears here and there in solitary positions in the cultivated areas, and even in uncleared land.

The plant being annual, where control is desirable it is essential to eradicate before seeding commences. Being of only sporadic occurrence the best method is hand-pulling, the plants coming out of cultivated soil with ease. Hoeing may be practised as an alternative method.

Description of Plant.—An erect annual of one to two feet, quite hairless, with thick green or purple hollow stems from which a milky sap issues when injury takes place. Leaves alternate, the lower ones deeply divided, the lobes irregularly and shortly toothed, upper leaves lance-shaped, clasping the stem, and the uppermost undivided, but all shortly toothed.

Flowers resembling those of the Dandelion, the heads in terminal clusters or umbels; involucre hairless, composed of numerous green narrow bracts. Florets yellow, all ligulate (as illustrated at C.). Achenes brown, oblong or thick, spindle-shaped, ribbed lengthwise, and also wrinkled transversely. Pappus consisting of fine, silky, simple hairs.

For further particulars see plate.

MILK THISTLE.

(*Sonchus oleraceus*, Linn.)

Upper portion of plant (reduced); inflorescence (slightly reduced); flower (much enlarged); and "seed" (achene) much enlarged.

SILAGE AT "CUTTENING."

J. DEANE HAMMOND,
"Cuttening," Kellerberrin.

Losses amongst both cattle and ewes have occurred towards the end of summer for some years past, notwithstanding special efforts to avoid these by feeding oats and hay, supplemented with purchased bran. As an additional means of avoiding these losses two reinforced concrete silos were built, which were filled in October with "Florence" wheat cut green. The wheat was cut, carted, and chaffed the same day, the silos being filled by an "Ohio" cutter and blower. By filling portion of one silo, and then turning the chute to the other, the silage had time to settle, and after both had been filled the material was allowed a week further for settling purposes, after which they were filled again to the roof—thus 200 tons were stored in the two silos. This was produced from 40 to 50 acres.

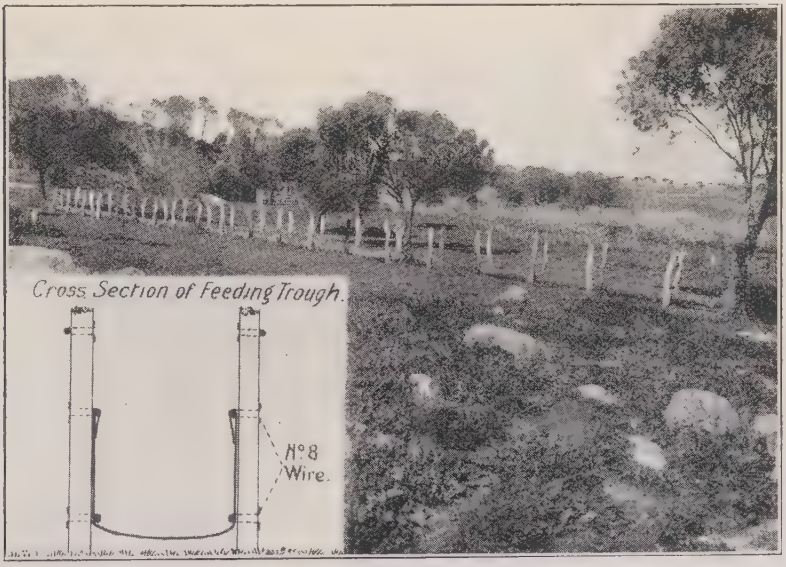
The twin silos at "Cuttening."

In December the silage was fed to the milking cows and two small lots of sheep, and at the end of April 2,500 sheep were fed entirely on silage for over a month and until there was an abundance of strong succulent feed.

These sheep were divided into three lots and fed twice a day. After getting accustomed to the silage they ate it greedily.

The feeding troughs were 40, 60, and 80 yards long respectively, though it would have been better if each had been 80 yards long, as it frequently happened that sheep were knocked into the troughs, and had to be pulled out. To avoid loss in this respect it was necessary to go along each trough half an hour after feeding, as it was found the first rush caused the damage.

The troughs were made of sound chaff bags attached to wires between two rows of jam posts; the posts were placed at intervals of six feet in the rows, which were about 10 inches apart. One wire, about 14 inches from the ground, was placed on the inside of each row of posts, and on this the chaff bags were threaded through the fold in the side of the bags. The bags were sewn together at the ends, in such a manner that the side seams were not continuous, but so that those of alternate bags were on opposite sides of



A Feeding Trough at "Cuttening."
(The inset shows a cross section with the position of the wires.)

the trough. An additional wire was placed on either side at the bottom of the trough to keep the bags taut, and to avoid waste by the wind flapping the bags about. These bottom wires were inside the trough, but were on the outside of the bagging, not threaded through it. The wires were attached to the posts by loops made out of fencing wire; these loops were passed round the wire through half-inch holes in the posts, and their ends turned in opposite directions on the other side of the post. Details of the construction of the trough may be seen from the illustration (inset) herewith. Two other wires about eight inches apart are required above on either side to prevent the sheep rushing through and jumping over the feeder. A straining post is fixed a each end, and all wires strained tight. If well made with good posts and No. 8 wire the feeders will last many years, the bags only needing to be renewed annually.

Each sheep eats 2½ to 3 lbs. per day, and it is best not to have more than 600 sheep in one feeding lot. At "Cuttening" there were about 100 acres of green timbered country where each feeder was located. This gave cover, and occasionally jam branches were lopped, of which the sheep ate freely, while also, salt was supplied for each lot, and water in each paddock.

There is still enough silage left for the cows and working horses until the silos are filled again. The working horses were fed a few bags nightly, *i.e.*, about two large double handfuls each. This, when mixed with the chaff, was very much appreciated. There have been no losses amongst the cows or ewes since feeding the silage this year, nor has there been any colic amongst the horses.

It is intended to use the oat crop for silage in the future. For sheep it is essential that the silage should be cut short, say, ½in.; it should also be well cut, so a grinder for the knives is required, as a file will not touch them.

One advantage in having silage is that the early growth of grass and young fodder crops can be saved. This, under ordinary circumstances, would be fed off. With a supply of silage, paddocks may be saved until a strong growth of pasture is secured.

Experience with these two silos proves that sheep and other stock can be carried better than before, and it is intended to extend in this direction by building more silos.

Wattle Time.

"Why should not wattle do for mistletoe?"
Said one—they were but two—where wattles grow.

He was her lover, too, who urged her so—
"Why should not wattle do for mistletoe?"

A rose cheek rosier grew; rose lips breathed low,
"Since it is here, and YOU, I hardly know
Why wattle should not do."

—Douglas Brooke Wheelton Sladen.

STAGGER WEED.

(*Stachys arvensis*, Linn.)

W. M. Carne, F.L.S., and C. A. Gardner.

Stagger Weed is a weak, spreading annual, rarely exceeding nine inches in height. It is hairy, has leaves placed in pairs on the stem, and small violet or pale purple flowers grouped among the leaves. In England it is known as Hedge Nettle, though it has no stinging hairs.

Though found occasionally in the summer in moist places, Stagger Weed is essentially a plant of the cool wet period of the year, from May to October. It is common in gardens and orchards of the coastal plain and Darling Range, along roadsides, waste places, and in pasture land, especially where the soil is moist and shaded. It seeds prolifically.

It has no evil reputation in this State, and is not regarded as of consequence out of gardens. It may, however, some day become of importance to stock-owners as will be shown. The name Stagger Weed originated many years ago in New South Wales and Queensland. The origin of the name, of recent years, came into dispute, some claiming that it was a corruption of the Latin name, others that farmers believed it responsible for a trouble in sheep known as "Staggers" or "Shivers."

It was not until 1925 that it was shown at the Veterinary Research Station, Glenfield, New South Wales, that this plant had been justly named*. Previous work in the same State† had shown that the common Mallow (*Malva parviflora*) could also be held responsible for staggers. This year it has been shown in regard to Stagger Weed that the injurious substance, whatever it may be, occurs principally in the seeds.‡

"Staggers" or "shivers" refers to a condition in which sheep, apparently normal in the paddock, develop shivers and a staggering gait when driven. The trouble may be indicated by sheep "knocking up," and by urinary irritation, causing frequent attempts to urinate. Recovery may be rapid, especially if the sheep are taken off the weed. Enforced exercise may be followed by death. Lambs are more readily affected than adult sheep. Sucking lambs may be affected from the mother's milk.

There is always, then, the possibility that sheep brought down to the coast, and placed in a paddock containing a luxuriant growth of Stagger Weed, with or without Mallow, may eat sufficient to develop staggers when driven. No cases of this trouble have yet been reported.

Description of Plant.—A rough rather hairy annual, with weak ascending or erect stems, one to one and a-half feet high, the stems four-angled. Leaves oval or somewhat heart-shaped, the lowest being the largest, and on long stalks, the upper leaves smaller with stalks becoming much smaller, all opposite, each pair being alternately opposite with those im-

* Seddon.—Vet. Research Rept. No. 1, Science Bull. 24, Dept. of Agriculture. New South Wales, 1925.

† Dodd and Henry.—Staggers or Shivers in Livestock. Science Bull. 23, Dept. Agriculture, New South Wales, 1923.

‡ Seddon, Hindmarsh and Carne.—Vet. Research Rept. No. 2. Science Bull. 26, Dept. Agriculture, New South Wales, 1926.

STAGGER WEED.

(*Stachys arvensis*, L.)

A Habit. B Flowers. C A leaf showing venation. D Bud. E. Corolla (opened). F Calyx, and the same sectioned showing nuts. G Seeds.

(A reduced; B and C about natural size; D, E, F, and G variously enlarged.)

mediately above and below, the margins toothed with rounded notches, the veins being deeply impressed on the upper surface of the leaf, and raised on the lower side.

Flowers small, violet, in axillary whorls (*i.e.*, at the upper side of the bases of the leaves) of four to six flowers; calyx bell-shaped, hairy, five-toothed, becoming purple when in fruit, the teeth lance-shaped, bordered by white hairs, and acute. Corolla small, scarcely exceeding the calyx, the lips short and downy-hairy. Fruit of four nuts contained in the calyx, brown when ripe, obovoid and minutely tuberculate under a lens.

For further particulars see plate.

KIKUYU GRASS.

In the March issue this year of the "Journal of the Department of Agriculture" appeared a note on the above by Mr. C. A. Gardner, in which it was stated that the first record of this plant having flowered in Western Australia, and perhaps the first record of its having done so in the whole of Australia, happened at the residence of Mr. Russell Walton of Inglewood. In the "Agricultural Gazette" of New South Wales published in August last a reference states that the first record of grass flowering in that State occurred in February, 1924, when specimens were collected at the Hurlstone Agricultural High School, Hurlstone Park, a suburb of Sydney, while in February, 1925, flowering specimens of the grass were obtained from Wollongbar Experiment Farm near Lismore, and from Ermington, near Ryde. As Mr. Walton's results were first observed during the earlier months of last summer, it would appear that they were anticipated in the Eastern State; however, as there has been no publication of the fact prior to the August issue of the "Agricultural Gazette," and Mr. Gardner made his comments in March last, it is obvious that he could refer only to records made available to the public.

Read for to-day, read for to-morrow, but—to-day and to-morrow—to develop the habit of keeping in touch with what the world is thinking and doing, lest that day comes which finds us marooned, isolated, side tracked, dead but not buried.—"John Adams Love."

HERD TESTING.

PURE BRED COWS—PROFIT OVER COST OF FEEDING.

P. G. HAMPSHIRE, Superintendent of Dairying.
G. K. BARON-HAY, Dairy Adviser.

In continuance of the precedent established by the Dairy Branch of the Department, detailed figures are made available showing yields of milk and fat of all pure bred cows submitted to official test.

This subject was first taken up with the view of combating an erroneous idea prevailing among some farmers that pure bred cows, particularly high yielders, were not commercial cows, and that only well-to-do owners, who more or less kept a pure stud as a hobby, could afford to enter the "pure bred" business. The figures published each year effectively prove the fallacy of this assumption, and it is generally recognised now that the "pure bred for production" cow is the most economical animal, just as the barn-door fowl which generally was supposed to be the best egg-layer has been displaced by egg-laying strains of pure bred stock. It is not desired to convey the impression that *all* pure bred cows are high producers or profitable, as testing reveals there can be *pure bred scrubs*. Official testing is designed to eliminate the non-producing pure bred cow—a pure bred is only valuable if she is an economical milk producer. Where we have this combination, her male progeny are then valuable to transmit milk producing qualities in "graded up" heifers, or in further improving pure bred heifers.

The tables supplied set out the results of all cows tested during the year ended 30th June, 1926, and the averages of all cows tested during the last three years. The figures cover each animal tested under the Official Australian Pure Bred Dairy Cattle Production Testing Scheme, including those which failed to pass the standard.

The tables show, for the cows in each herd, the average yield of milk, fat, skim milk, values of each, cost of feed, profit over cost of feed, cost of feed per 100 lbs. of fat yielded, and cost of feed per gallon of milk yielded.

The feeding of cows is closely scrutinised by the Official Testers and an accurate record is kept. Concentrated feeds are debited at the yearly market average cost, and all green feeds are charged at farm cost price, and pasture is debited at 1s. 6d. per week.

Some of the herds referred to in the tables are situated in the metropolitan area, and their produce is being sold as fresh milk, and, in certain cases, the average cost per cow for feeding appears high; however, the sale of whole milk more than counterbalances this. In practice, the amount allowed for whole milk can be increased by from 15 per cent. to 20 per cent., as most of the milk is sold at from 1s. 6d. to 1s. 8d. per gallon in place of the 1s. 3d. per gallon which they are credited.

Mokine Lily VI., age 4 years.
(591 lbs. butter fat in 273 days.)

TABLE I.—HERDS IN ORDER OF MERIT AS PRODUCERS OF BUTTER-FAT—YEAR ENDING 30TH JUNE, 1926.

Herd.	(1) Average Fat per Cow for period nine months (273 days).	(2) Average Skim Milk per Cow for period, allowing for rearing calf.	(3) Value of Fat for period at 1/7 per lb. (average price ruling).	(4) Value of Skim Milk for period at 2d. per gallon.	(5) Average Value of Fat and Skim Milk per Cow for period.	(6) Cost of Feed per Cow for the period.	(7) Profit per Cow for period by sale of Fat.	(8) Value of whole Milk at 1/3 per gallon allowing for rearing calf	(9) Profit per Cow by sale of Fresh Milk at 1/3 per gallon.	(10) Cost of Feed for 100lbs. of Fat.	(11) Cost of Feed for 1 gallon of Milk.
		gallons.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	d.
A.	527·00	595	41 14 5	4 19 2	46 13 7	19 1 9	27 11 10	48 3 9	29 2 0	3 12 3	5·46
B.	372·00	486	29 9 0	4 1 0	33 10 0	12 4 5	21 5 7	39 17 0	27 12 7	3 5 8	3·66
C.	333·14	367	26 7 6	3 1 1	29 8 7	11 15 3	17 13 4	32 8 11	20 13 8	3 10 7	4·65
D.	290·02	299	22 19 3	2 9 10	25 9 1	10 4 10	15 4 3	27 5 3	17 0 5	3 10 7	4·62
E.	314·10	412	24 17 4	3 8 7	28 5 11	13 8 7	14 17 4	34 8 5	20 19 10	4 3 7	4·75
F.	318·33	353	25 4 0	2 18 10	28 2 10	13 7 7	14 15 3	30 11 10	17 4 3	4 4 0	5·42
G.	267·30	393	21 2 0	3 5 6	24 7 6	14 0 7	10 6 11	28 11 5	14 10 10	5 4 11	5·28
H.	339·97	365	26 18 3	3 0 9	29 19 0	19 13 8	10 5 4	31 13 7	11 19 11	5 15 10	7·61
I.	293·46	417	23 4 7	3 9 6	26 14 1	17 0 2	9 13 11	34 9 11	17 9 9	5 15 11	6·14
J.	234·00	352	18 10 6	2 18 9	21 9 3	15 7 3	6 2 0	29 10 7	14 3 4	6 11 4	6·23
K.	233·44	326	18 9 7	2 14 5	21 4 0	19 9 11	1 14 1	27 18 0	8 8 1	6 4 2	8·32
Averages ...	312·01	393·2	24 14 0	3 5 6	27 19 6	14 14 7	13 4 11	32 5 5	17 10 10	4 14 5	5·66

AVERAGE COST OF FEEDS.

Oaten or Wheaten Chaff, £4 per ton; Bran, £8 5s. 0d. per ton; Pollard, £8 5s 0d. per ton; Crushed Oats, 3s. per bushel; Linseed, £13 10s. 0d. per ton; Lucerne pasture, 3s. week; Lucerne Hay, £7 per ton; Green Maize, 7s. per ton; Silage 10s. per ton; Brewer's Grains, 6d. per bushel; Pasture, 1s. 6d. week; Sudan Grass Pasture 3s. week or 7s. per ton; Green Lucerne, £2 per ton; Maize 7s. 6d. per bushel.

TABLE II.—HERDS IN ORDER OF MERIT AS PRODUCERS OF MILK—YEAR ENDING 30TH JUNE, 1926.

Herd.	Milk, Average Gallons.	Fat, Average Pounds.	Cost of Feed per Cow.	Profit as Milk.	Profit as Fat.	Cost to produce 100lbs. of Fat.	Cost to produce 1 gallon of Milk.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.
A.	861	527·00	19 1 9	29 2 0	27 11 10	3 12 3	5·46
B.	740	372·00	12 4 5	27 12 7	21 5 7	3 5 8	3·66
E.	658	314·10	13 8 7	20 19 10	14 17 4	4 3 7	4·75
C.	608	333·14	11 15 3	20 13 8	17 13 4	3 10 7	4·65
I.	663	293·46	17 0 2	17 9 9	9 13 11	5 15 11	6·14
F.	592	318·33	13 7 7	17 4 3	14 15 3	4 4 0	5·42
D.	532	290·02	10 4 10	17 0 5	15 4 3	3 10 7	6·62
G.	637	267·30	14 0 7	14 10 10	10 6 11	5 4 11	5·28
J.	591	234·00	15 7 3	14 3 4	6 2 0	6 11 4	6·23
H.	605	339·97	19 13 8	11 19 11	10 5 4	5 15 10	7·61
K.	562	233·44	19 9 11	8 8 1	1 14 1	6 4 2	8·32
Average	624	312·01	15 1 4	17 6 6	13 4 11	4 14 5	5·66

Average Cost of Feeds (see Table I.).

Representatives of Herd "A."—T. H. Wilding, Mokine, W.A.

Lady Guildford, Empire Lily III., Fancy, Empire Lily V.
During the year five cows in this herd averaged 576 lbs. of butter fat in 273 days.

TABLE III.—HERDS IN ORDER OF MERIT AS PRODUCERS OF BUTTER-FAT—AVERAGE RESULTS FOR THREE YEARS 1924, 1925, 1926.

Herd.	(1) Average Fat per Cow for three Years.	(2) Average Skim Milk per Cow, allowing for rearing Calf.	(3) Value of Fat at prices ruling during each Year. (see below).	(4) Value of Skim Milk at 2d. Gallon.	(5) Average Value of Fat and Skim Milk for three Periods.	(6) Average Cost of Feed per Cow for three Years.	(7) Average Profit per Cow for three Periods.	(8) Value of whole Milk at 1/3 Gall., allowing for rearing Calf.	(9) Profit per Cow by sale whole Milk at 1/3 Gallon.	(10) Average Cost of Feed for 100lbs. Fat.	(11) Average Cost of Feed for 1 Gall. of Milk.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.
A.	456·7	506	35 10 5	4 4 4	39 14 9	14 16 8	24 18 1	47 12 0	32 15 4	3 4 11	4·67
D.	358·2	417	27 9 4	3 9 6	30 18 10	11 6 3	19 12 7	41 14 0	30 7 9	3 3 2	4·07
*L.	342·8	473	26 7 5	3 18 10	30 6 3	11 1 4	17 4 11	45 6 0	34 4 8	3 4 6	3·67
B.	321·6	385	24 19 4	3 4 1	28 3 5	11 2 10	17 0 7	39 4 0	28 1 2	3 9 3	4·26
F.	342·9	432	26 12 3	3 12 0	30 4 3	14 12 0	15 12 3	42 10 0	27 18 0	4 5 1	5·15
C.	323·1	333	25 4 3	2 15 5	27 19 8	12 14 11	15 4 9	36 4 0	23 9 1	3 18 11	5·28
E.	318·7	399	24 15 8	3 6 5	28 2 1	13 6 1	14 16 0	40 5 0	26 18 11	4 3 6	4·96
*M.	306·3	354	23 14 7	2 19 0	26 13 7	12 8 1	13 15 6	42 2 9	24 2 11	4 4 3	5·22
H.	348·8	389	27 19 7	3 4 9	31 4 4	18 0 4	13 4 0	42 10 0	21 9 8	5 3 4	5·15
*N.	570·0	769	28 11 6	6 8 1	34 19 7	22 9 11	12 9 8	65 17 0	43 7 1	6 1 7	5·12
G.	205·2	321	17 9 5	2 13 6	20 2 11	9 16 0	10 6 1	34 16 0	24 19 2	4 15 11	4·24
J.	284·7	461	22 2 10	3 16 10	25 19 8	16 17 1	9 2 9	44 10 0	27 12 11	5 18 5	5·68
*I.	273·2	391	20 16 9	3 5 1	24 1 10	15 8 6	8 13 4	39 11 0	24 2 6	5 12 11	5·85
K.	230·9	334	18 0 6	2 15 8	20 16 2	15 9 10	5 6 4	35 19 0	20 9 2	6 14 1	6·46
Averages	320·2	426	24 19 7	3 11 0	28 10 7	14 5 9	14 4 10	42 2 9	27 17 0	4 9 3	5·07

* Results two years only.

Average price of Butter-fat per pound—1923–24, 1s. 7½d.; 1924–25, 1s. 5½d.: 1925–26, 1s. 7d.

Feed costs—Average market prices ruling each year.

TABLE IV.—HERDS IN ORDER OF MERIT AS PRODUCERS OF MILK—AVERAGE RESULTS FOR THREE YEARS 1924, 1925, 1926.

Herd.	Milk, Average Gallons.	Fat, Average Pounds.	Cost of Feed per Cow.	Profit as Milk.	Profit as Fat.	Cost to produce 100lbs. of Fat.	Cost to produce 1 gallon of Milk.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.
*N.	1,504	370·0	22 9 11	43 7 1	12 9 8	6 1 7	5·12
*L.	725	342·8	11 1 4	34 4 8	19 4 11	3 4 6	3·6
A.	762	456·7	14 16 8	32 15 4	24 18 1	3 4 11	4·6
D.	667	358·2	11 6 3	30 7 9	19 12 7	3 3 2	4·07
B.	627	321·6	11 2 10	28 1 2	17 0 7	3 9 3	4·26
F.	680	342·9	14 12 0	27 18 0	15 12 3	4 5 1	5·15
J.	712	284·7	16 17 1	27 12 11	9 2 7	5 18 5	5·68
E.	644	318·7	13 6 1	26 18 11	14 16 0	4 3 6	4·96
G.	557	205·2	9 16 10	24 19 2	10 6 1	4 15 11	4·24
*M.	593	306·3	12 18 1	24 2 11	13 15 6	4 4 3	5·22
*I.	633	273·2	15 8 6	24 2 6	8 13 4	5 12 11	5·85
C.	579	323·1	12 14 11	23 9 1	15 4 9	3 18 11	5·28
*H.	632	348·8	18 0 4	21 9 8	13 4 0	5 3 4	6·84
K.	575	23·9	15 9 10	20 9 2	5 6 4	6 14 1	6·46
Averages	676	320·2	14 5 9	27 17 0	14 4 10	4 9 3	5·07

* Results two years only.

Feed Costs: Average prices ruling each year.

Deductions are made for feeding the pure bred calf, as, in the case of above standard pure bred producers, the male calves are all reared.

It is pointed out that the figures given are for 273 days or 9 months' production of the cows in the herds; many of the cows milk longer.

To the profit over cost of feed must be added the value of the yearling pure bred calf, and this, in round figures, might safely be shown as £15 profit, as the value of milk required to wean the calf has already been deducted.

The West Australian Government during the last two years has acquired all the available pure bred yearling bulls, ex above standard cows, at an average price which should show the above-mentioned margin of profit to breeders.

As the average profit over cost of feed of all cows for *three years*—by sale of milk—is £27 17s., this means an average of £42 17s. per cow, and, in the case of fat, £29 4s. 10d. per cow. This shows that an average herd of these West Australian pure bred cows would return to their owner an amount in the vicinity of from £730 (for fat) to £1,070 (for milk) over cost of feeding for a period of twelve months.

TABLE V.—AVERAGE OF ALL COWS UNDER TEST FOR THREE YEARS.

	£	s.	d.
1.—676 gallons Milk and 320·2lbs. Fat per cow			
2.—407 gallons Skim Milk			
3.—Value of Fat at average price ruling three years	24	19	7
4.—Value of Skim Milk at 2d. per gallon	3	11	0
5.—Total credits to cow for sale of Fat and value of Skim Milk	28	10	7
6.—Average cost of Feed for three years—all cows	14	5	9
7.—Profit through sale of Fat, after deducting feed costs—three years' average	14	4	10
8.—Value of Fresh Milk at 1/3 per gallon, after allowing for rearing calf—three years' average	42	2	9
9.—Profit through sale of Milk at 1/3 per gallon, after deducting cost of feed—three years' average	27	17	0
10.—Average cost of Feed per 100lbs. Fat produced	4	9	3
1.—Average cost of Feed per 1 gallon Milk produced	0	0	5·07

Add value of Pure Bred Yearling Progeny.

TABLE VI.—HERDS IN ORDER OF MERIT SHOWING COST OF FEED PER 100LBS. FAT—AVERAGE RESULTS FOR THREE YEARS 1924, 1925, 1926.

Herd.	Cost of Feed for 100lbs. Fat.	Under Average.	Over Average.
	£ s. d.	£ s. d.	£ s. d.
D.	3 3 2	1 6 1	...
*L.	3 4 6	1 4 9	...
A.	3 4 11	1 4 4	...
B.	3 9 3	1 0 0	...
C.	3 18 11	0 10 4	...
E.	4 3 6	0 5 9	...
*M.	4 4 3	0 5 0	...
F.	4 5 1	0 4 2	...
G.	4 15 11	...	0 6 8
*H.	5 3 4	...	0 14 1
I.	5 12 11	...	1 3 8
J.	5 18 5	...	1 9 2
*N	6 1 7	...	1 12 4
K.	6 14 1	...	2 4 10

Average of all Herds—£4 9s. 3d.

* Results two years only.

TABLE VII.—HERDS IN ORDER OF MERIT SHOWING COST OF FEED PER GALLON OF MILK PRODUCED— AVERAGE RESULTS FOR THREE YEARS 1924, 1925, 1926.

Herd.	Cost of Feed per gallon of Milk.	Under Average.	Over Average
	pence.	pence.	pence
*L.	3·67	1·40	...
D.	4·07	1·00	...
G.	4·24	·83	...
B.	4·26	·81	...
A.	4·67	·40	...
E.	4·96	·11	...
*N.	5·12	...	·05
F.	5·15	...	·08
*M.	5·22	...	·15
C.	5·28	...	·21
J.	5·68	...	·61
*I.	5·85	...	·78
K.	6·46	...	1·39
*H.	6·84	...	1·77

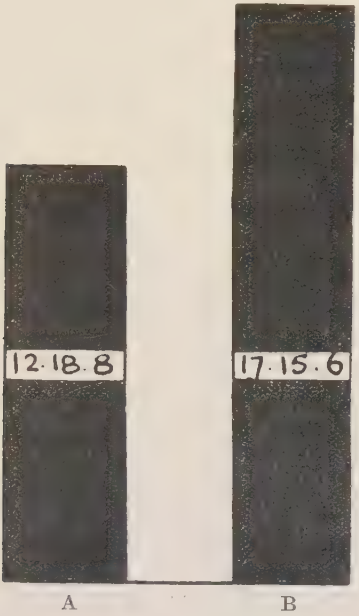
Average of all Herds—5·07d.

* Results two years only.

I.—COST OF FEEDING.

A.—Country herds.

B.—Metropolitan herds.



A.—Average of 12 herds for 3 years.

B.—Average of 5 herds for 3 years.

Notes on Tables and Graphs.

Table I.

This table shows the details of milk and fat production, cost of feed, and value over cost of feed of all cows during the year, with herds placed in order of merit as producers of fat.

The columns of the table have been numbered, and the following is a further explanation of these:—

Column 1 shows the average fat production of each herd. It will be noted that the leading herd has the very fine average of 527 lbs. fat in 273 days; this is a herd of six Jersey cows.

Column 2 shows the amount of skim milk available after making due allowance for separation and an approximate amount utilised for feeding the calf. In the first place, 10 per cent. is deducted from the total milk yield to allow for cream, and a further 180 gallons is deducted from the skim milk as a reasonable amount to feed the calf.

Column 3 shows the average gross value of butter fat yielded by each cow in the herd, at the average price paid by the butter factories during the year.

Column 4 is self explanatory.

Column 5 shows total credits of the cow, but does not include the value of the pure bred yearling. To obtain a true value of the earnings of each pure bred cow, the value of the pure bred yearling should be added.

Column 6 shows the average cost of feeding each cow in each herd. This has been arrived at by a most careful check of the foodstuffs that the animals receive during the lactation. The values of the various foodstuffs are shown below, and, in the case of concentrated foods, are given at the average market rates ruling. Other foodstuffs are worked out on "farm grown" values.

Column 7 shows profit per cow for nine months over cost of feeding, by the sale of fat.

Column 8 shows the total value of the whole milk yielded by the cows at 1s. 3d. per gallon, after making due allowance for the rearing of the calf, deducting a certain amount as whole milk and, in addition, 145 gallons of skim milk, crediting the cow with the butter fat taken from the skim milk at market rates.

Column 9 shows the average profit per cow in each herd by the sale of milk at 1s. 3d. per gallon, after deducting the cost of feed.

Columns 10 and 11 show the cost of feed per 100 lbs. fat yielded and per gallon of milk yielded. These columns enable the reader to assess both the value of the cow as an economical producer and the owner or feeder as a manager.

Table II.

This table shows all the herds in order of merit as producers of milk.

Column 1 shows the average milk yielded per cow.

Column 2 shows the average fat yielded per cow.

Column 3 shows the average cost of feeding.

Column 4 shows the average profit per cow in each herd over cost of feeding as producers of milk.

Column 5 shows the average profit per cow in each herd over cost of feeding as producers of butter fat.

Columns 6 and 7 are similar to Columns 10 and 11 in Table I, but herds are placed in order of merit as producers of milk.

It will be noted that, in the case of Herds "A," "D," and "H," the milk and fat sales vary very little. These are Jersey herds.

In the case of Herds "B," "E," "I," "J," and "K," the profit over cost of feeding is much in the favour of the sale of milk. Four of these herds are Milking Shorthorn and one Guernsey.

Table III.

This table sets out the herds in order of merit as producers of butter fat over 3 years.

The high herd, it will be noted, has the very fine average yield of 456 lbs. butter fat per cow per lactation of nine months.

The average of all cows is also good, being 320 lbs. fat.

The high herd shows a profit of £24 18s. 1d. per cow over cost of feed, whereas the low herd only shows a profit of £5 6s. 4d. per cow over cost of feed.

By a close examination of the feed costs of the herds, it is found that, where silage is fed, feed costs are materially reduced; especially is this so in districts where the rainfall is low and pasturage short-lived.

II.—Profit of Fat over cost of Feeding.

A.—Three worst herds.

B.—Three best herds.

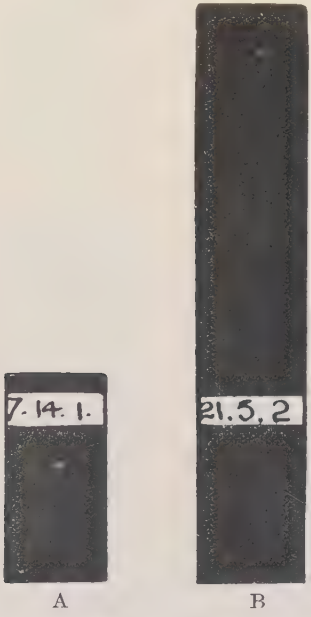


Table IV.

This table sets out the herds in order of merit as producers of milk.

The variation in the profit from the high herd over the low herd, as producers of milk, is not nearly so marked as shown in Table III., which sets out the herds in order of merit as producers of butter fat. The deductions to be made from closely examining the two tables are that feeding for milk production is probably of greater value than breeding, whereas, in the case of herds producing butter fat, all evidence points to breeding being the main factor in the economical production of butter fat.

It will be noted that the leading herd has the fine average of 1,054 gallons of milk per cow per nine months' lactation. This exceeds the low herd by 497 gallons of milk.

Table V.

This table is self explanatory.

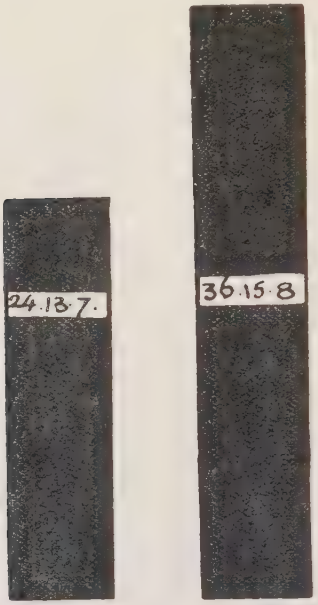
Tables VI. and VII.

These tables set out the herds in order of merit as economical producers per 100 lbs. butter fat and per gallon of milk.

III.—Profit of Milk over cost of feeding.

A.—Three worst herds.

B.—Three best herds.



Graph 1.

This shows the cost of feeding country herds and metropolitan herds. The marked difference in favour of the country herds is a striking lesson in regard to the growing of the foodstuffs for the cows on the farm.

Graph 2.—This shows the comparative *profit of fat over cost of feeding* of the three worst herds and the three best herds under test.

The graph shows conclusively the need for herd testing to discover the low producers of butter fat, and their "culling" from the herd.

Graph 3.—This shows the comparative *profit of milk over cost of feeding* of the three worst herds and the three best herds under test.

It will be noticed that here again the differences between the relative profits are great, but not so striking as in the herds compared for butter fat production.

This indicates that dairy farmers selling whole milk are able to make a profit from a herd yielding milk with a low average test, as compared with farmers relying on the sale of butter fat.

THE HOME TANNING OF SHEEP AND OTHER SKINS.

H. SALT, B.Sc., A.I.C.

1. The skins should first be made as clean as possible. Dried skins must be soaked in water for two days or more until just as soft as fresh skins.

All the fat and loose skin on the flesh side (*i.e.*, inside) must be scraped off, because the greasier the skin, the slower the penetration of the tanning liquors.

Boil a few ounces of soap with water, and when dissolved make up to about a gallon of cold water. Use the solution *cold* to wash dirt and grease from the skin and wool. A few drops of phenyle or other carbolic disinfectant is useful in the washing water. When the skin is clean enough remove all trace of soap by rinsing.

2. Dissolve 1lb. alum and ½lb. salt in two gallons of water. Dissolve 1oz. (no more) of soda in a pint of water, and add to the first solution. Stir well for five minutes.

Soak the cleaned skins in the liquor for at least one week. Thick skins and greasy skins will take several days longer. It is always best to allow plenty of time for tanning, because over-tanning is improbable, but under-tanning might easily result. If the tanning vessel is big enough, lay the skins out on the bottom, but if they must be doubled up whilst tanning, move them at least twice a day. This prevents uneven tanning.

If desired chrome alum can be used instead of ordinary alum. Chrome alum is the more expensive, but has the advantage that the tanned skin will stand much more washing, and is generally better.

Fig. 1.—A small staker.

3. When the skins are tanned through (a little cut in the neck should be the same colour right through) wash them once in cold water. Too much washing is not advisable, but the alum is best removed from the wool. Let them drain over a pole with the wool outside for a few hours till they feel thoroughly damp, but not wet. Then nail them on a board, stretching them out as flat as possible. The better the stretching in drying, the easier is the working up afterwards.

If a slight greasiness and smell does not matter in the finished rug, rub a little *soft grease* or Neatsfoot oil over the flesh side before nailing out to dry.

When quite dry leave the skins a week or two so that the tannage can mature.

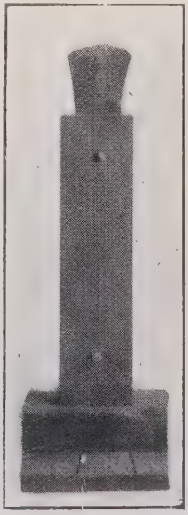


Fig. 2.—A staker made from an axe head.

4. The great secret of making a soft alum leather is in working it up well after drying. For this purpose a staking tool can be made of a piece of metal (or perhaps hardwood). This is shaped as shown in Fig. 1.

The edge is blunt; an old axe head with blunt edge and rounded corners will serve quite well. An axe mounted for this purpose is shown in Fig. 2. The top of the axe should be about three feet from the ground.

Fig. 3.

To soften them, the skins are pulled over this edge as shown in Fig. 3. A considerable amount of pressure can be used.

If the skins are damped on the flesh side with a little water to soften them, they will stake very much easier. Very little moisture is needed for this purpose, and some preliminary softening can be given by working with the hands.

Unless the loose tissue has been scraped off well before tanning, the staking will raise the flesh side. If the loose flesh has not been removed before tanning, this can be done now by rubbing with pumice-stone, or by gently pressing the skin to a quick-moving grindstone. A better method than the former, and safer than the latter, is to throw the skin over a pole and scrape it with a round tin lid (the lid of a tobacco tin will serve, but a larger one will work the skins quicker). Scraping must be done with judgment.

The skins should now be soft, and the flesh side fairly smooth. The wool can be combed, brushed, and, as a final finish, a narrow strip can be cut all round the skin, since the edges are often difficult to soften.

When mats of this nature are washed they sometimes dry hard. A little staking will always soften them.

Points to remember:—

1. The wool on a fresh skin is more likely to be firm than the wool on a skin which has been kept some time.
2. If the wool needs washing, do it before tanning.
3. Give the skins plenty of time for tanning, and do not forget to turn them.
4. If there is a horny streak in the middle of the dry leather, the skin is not fully tanned.
5. Pliable leather is obtained by working the skins after tanning. A damp skin is easiest to soften.

BARK TANNAGE.

Tannage with bark is not very easy in rough conditions, and, on the whole, is much slower. The skins are best lightly tanned first, and then finished with stronger liquors.

All iron must be avoided, if possible, because the tannin will blacken with iron, so that, after drying the bark, it is advisable to break off any portions blackened by the iron of the axe. Break up the dry bark in small pieces, and soak for a day. The following quantities may be found very suitable (and at least one should be available in most parts of the State):—

Mallet, 1 lb.; Wattle, 1½ lbs.; Mallee, 2½ lbs.; Gimlet, 1½ lbs.; Wandoo, 2 lbs.; Jam, 5 lbs.

One gallon of water to the amount of bark given above is used for soaking, and one-third of this is added to a gallon of fresh water. The skins are allowed to lie in this weaker solution until tanned through. This can be judged by making a small cut in the thickest part of the skin, and observing whether it appears the same colour right throughout.

When this first tannage is complete add the rest of the liquor, and leave for another week. The skins can be finished off as for the alum tannage if hard, but if they have been tanned through they should be soft enough for rugs.

The quantities of bark are, of course, approximate, and must be varied according to the amount of liquor required. If several skins are to be tanned in succession, the old liquor from one lot will serve as the first liquor for the next lot, strengthening up after the cut shows an even colour. A liquor should improve with constant use up to the third or fourth time.

SOIL—ITS ORIGIN AND FORMATION.

N. DAVENPORT, B.Sc. (Agric.),
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Soil is the result of the action of the elements of weathering on pre-existing rock masses. This decay is of such a slow nature that its rate, in most cases, is not discernible in a lifetime. In fact, the formation of soil is such a slow process that we are inclined to take its presence as a matter of course, with no thought as to its origin.

We will treat, in a brief way, with the classification and composition of rocks before considering their decay.

A mineral is a naturally occurring substance of the earth's crust, and has a definite fixed chemical composition.

A rock is a heterogeneous mixture of two or more minerals and, therefore, has a variable composition. A single mineral, however, if occurring in large masses may be termed a rock.

Examples of minerals are:—

Quartz or Silica.—White sea sand is practically all silica.

Calcium Carbonate.—The main constituent of limestones.

Mica, Felspar, Hornblende.—These three are of complex composition, containing silica, and found in granite, gypsum or calcium sulphate, iron oxide, etc.

Examples of rocks are:—

Granite.—A mixture of quartz, felspar, and mica or hornblende.

Basalt.—A mixture of ferromagnesian felspars, such as augite and olivine apatite, etc.

Rocks are divided into three main classes, viz., Igneous, Metamorphic, and Sedimentary.

Igneous rocks are the source of the remaining two classes, and are the result of the cooling of the molten material in the earth.

When an ingenous rock has been subjected to great pressure or temperature, or both, its texture is altered and it assumes a more or less laminated appearance. The action of these forces is called Metamorphism, and the rocks are termed "metamorphic." Examples of metamorphic rocks are the schists and gneisses found in many of our gold-bearing centres.

Sedimentary rocks are formed by the accumulation of particles of igneous or metamorphic rocks, *e.g.*, the sandstones common in the coastal districts in the neighbourhood of Perth are sedimentary rocks, being composed mainly of silica, igneous or metamorphic in origin.

Igneous rocks are classified according to the percentage of silica contained in them—

Those with over 65 per cent. are termed "acid."
Those with over 55 to 65 per cent. are termed "intermediate."
Those with over 45 to 55 per cent. are termed "basic."
Those with under 45 per cent. are termed "ultrabasic."

The acid rocks are mostly of a light colour, a typical example being granite. The colour deepens as the acidity lessens till the ultrabasic rocks are practically black.

As a rule, the more basic a rock the more fertile is the soil derived from it.

The process of soil formation may be discussed under two headings, viz., disintegration and decomposition.

Disintegration.—This phase is essentiallly a physical one, *i.e.*, there is no effect on the chemical composition of the individual minerals. The result is a progressive diminution in the size of the rock fragments. The most important agents are—differences in temperature and frost.

Differences in Temperature.—When the sun's rays strike a rock surface it becomes heated and, in so doing, must of course expand. The rock being hottest at the surface, here we have greatest expansion which must diminish with the temperature in proportion to the distance from the surface. Hence it will be seen that unequal stresses and strains are set up which are accentuated if the rock mass is subjected to rapid cooling, the result being a splitting and cracking in all directions. With granite the effect of these forces is to crack the rock in a place parallel to the surface. In many outcrops this flaking or exfoliation is quite pronounced.

It must be borne in mind that the results noted are, of course, not produced by a single heating or cooling. The cracks are at first infinitesimal, but by repeated action gradually increase in size. Other things being equal, the coarser the rock the more readily it becomes disintegrated, also the more rapid the heating and cooling, and the greater the range in temperature the greater the effect on the rock mass.

Frost.—Into these cracks so formed, moisture from rain, dew, etc., finds its way, and if the temperature falls sufficiently frost may be formed. When water is converted into ice it expands one-tenth of its former volume, hence we see that by the formation of frost in these cracks a strain is set up which tends to make them still larger.

The mechanical effect of water in removing the smaller particles as they are formed aids disintegration by the continual exposure of fresh surfaces.

Other minor agents of disintegration are earthquakes, land slips, the wearing action of wind carrying solid material, etc.

Decomposition as disintegration.—The second phase, that of decomposition, is of a chemical nature, by its agents the complex minerals being broken down to chemically simpler ones.

The more important agents are water and the atmosphere (mainly the oxygen and carbon dioxide).

Water as rain, dew, etc., finds its way by seepage, capillarity, etc., into these rock fractures. It is an active solvent, and is the medium in which most of the chemical changes take place. Substances of even the slightest solubility are gradually removed by its incessant leaching action. This soluble matter ultimately reaches the sea per medium of creeks, rivers, etc.

The action of water is greatly increased by the presence of carbon dioxide. This gas is absorbed by the water which then more readily dissolves minerals by forming carbonates in solution, *e.g.*, limestone is removed at a greater rate, due to the formation and greater solubility of the bicarbonate, due to the presence of carbon dioxide in the water forming carbonic acid. The effect on silicates is more marked, the silica partly or wholly passing into solution and the bases forming their respective carbonates or bicarbonates (*e.g.*, orthoclase, a variety of felspar) loses its metallic base as the carbonate with the formation of insoluble clay and free silica. The change is expressed by the following chemical equation:—

$$K_2Al_2Si_6O_{16} + 2H_2O + CO_2 = H_4Al_2Si_2O_9 + 4SiO_2 + K_2CO_3$$

Felspar	Water	Carbon Dioxide	Clay	Silica	Pot Carbonate

The water besides acting as a solvent may enter into chemical combination with the minerals, forming hydrates such as limanite Fe_2O_3, $3H_2O$; gypsum $CaSO_4$, $2H_2O$, etc., which may be deposited or removed in solution according to their solubility.

Again, when water is exposed to the atmosphere, it dissolves a certain amount of air, a proportion of which is oxygen. This oxygenated water is an active chemical agent, and minerals become oxidised by its action.

$$e.g., \quad \underset{\text{Ferrous oxide}}{2FeO} + O = \underset{\text{Ferric oxide}}{Fe_2O_3}$$

Oxidation is accompanied by an increase in volume, and hence the further cracking and crumbling of the rock.

Other agents of decomposition are the acids derived from decaying organic matter, the action of plant roots, etc.

It, of course, will be understood that these forces of disintegration and decomposition are both acting simultaneously, the one exposing fresh surfaces to be acted upon and wholly or partially removed by the other.

In arid regions, disintegration will be the more marked owing to the small supply of moisture, while as climates become more humid so will the importance of agents of decomposition become greater. By these means rocks are broken down into finer fragments and simpler substances until these reach the stage when the resultant mass may be termed soil. It will be noticed that that portion exposed to the atmosphere will first reach this stage; the further from the surface the slower the action, for air, water, etc., would find it increasingly difficult to penetrate these areas.

A cross section of the country seen in quarry faces, railway cuttings, etc., will often demonstrate the stages in soil formation. Below the surface soil, which probably carries vegetation of some kind and contains more or less humus is what is termed the "subsoil." This is usually of lighter colour than the surface soil; it contains practically no humus with a higher clay content and less aeration. The subsoil in turn gives place to an area of small rock fragments mixed with decayed rock. Lower still is split and cracked rock interspersed with semi-altered material, and finally we have the unaltered rock. At times these stages are well defined, but as a rule they merge one into the other with no definite lines of demarcation.

During the process of weathering much of the material will be removed; in arid regions mainly by wind, and to some extent, by rain; in humid regions principally by solution and rain wash. In the mechanical removal of soil by water, the smallest and lightest material is carried furthest, and this accounts for the rich soil often found in valleys, with the poorer soils higher up the slope.

The longer an area is subjected to weathering the poorer will the resultant soil, *in situ*, be with respect to mineral matter only, for quartz itself is practically useless as a plant food, has a comparatively low solubility and consequently its percentage in the soil will gradually increase.

As a rule, acid rocks give poorer soils than basic ones, for the former are richer in quartz and lack phosphates, lime, etc. The basic rocks are our main supply of phosphatic material and also contain more lime, iron, and magnesia, three vital constituents of plant food.

THE SAN JOSE SCALE

(*Aspidiotus perniciosus*).

L. J. Newman, F.E.S.,
Entomologist.

I have chosen this insect as the subject of an article because it has been noted that there is a tendency on the part of some growers to become somewhat slack in regard to this and other orchard pests. There have admittedly been economic factors which have worked against the fruitgrower, and these have had a natural tendency to create a slackness in orchard sanitation. It is under such conditions that the Department has the greatest difficulty in keeping growers of produce up to standard.

Conditions of neglect in an orchard give rise to the rapid increase of insect and fungus pests.

Fortunately for us in this State the San Jose Scale has never assumed the serious pest it is reported to be in other parts of the world. This fact, however, should stimulate us to maintain a hold over it, grateful that it can be controlled with so comparatively little effort. Even as it know it here, we are aware that if neglected it has a serious effect upon the young wood, poisons and debilitates the tree, and marks the fruit. In the first place what are scales, and why are they so called, are questions that very naturally present themselves to the mind. In what manner do they differ from flies and other insects? In making these peculiar insects nature seems to have cut one of her most perplexing antics. Scales differ from other insects in several ways. In the first place the male alone is winged, and has only one pair of wings. When fully developed he has no mouth parts. The female, however, is even more poorly provided, as at no time of her existence does she possess any wings, but she does possess a well-developed mouth.

At hatching or at birth, according to species, both sexes are provided with sucking mouths, and both are equally active, crawling about over the plant in search of a desirable place to locate themselves, and when once determined, many species settle down and never move about again during their lives, while others travel more or less until partly fully grown.

Amongst scale insects there are great differences in appearance and habits. Some, like the Mealy Bugs (Dactylopinae), secrete a covering composed of a cottony material; others, like the Lecaniums (Black Scale), secrete a waxy continuous layer, which forms their protection. One remarkable group found in Australia forms hard galls of various shapes on the trees, inside which the coccid lives. Another group, known as the Hard or Armoured Scales (Diaspinae), includes the San Jose Scale, Red Scale, Mussel Scale, etc. The scale, whatever its nature, is only the covering, the true insects being beneath.

Scales are closely related to the Aphidae, both belonging to the order Hemiptera, meaning half-winged, and referring to the fore part of the upper or first pair of wings, which is thick and horny, the hinder portion alone being wing-like and membraneous. They are also known as Haustellate, that is, their mouth parts are formed for sucking plant juices and not chewing as in the Mandibulate insects, caterpillars, beetles, etc.

Mr. W. M. Maskell, a leading authority on scale insects, estimates that there are over 300 species found in Australia. Naturally those that have up to date caused most trouble have beem those introduced. I know of no native scale at present found here that is a serious orchard pest. If we enumerate the scales found in our orchards and gardens we will not find any native species amongst them, though some of our native species have been introduced into other countries and proved most serious pests there. This is the natural result following on the unbalancing of Nature. The host scale has been introduced without its natural enemies. The time may come, however, when some of our native scales may become troublesome owing to the cutting out of their native food plants, thus forcing them to seek fresh food plants for sustenance or die out. Nature is very persistent in this respect, and strongly objects to the elimination of any species whether animal or vegetable.

Although present probably throughout the entire temperate and tropical regions, scales attain their highest individual and numerical development in the latter.

It is beyond the scope of this article to allude to, much less to describe, the different sub-families and sections into which this important family of insects is divided. The ordinary observer will have no difficulty in concluding that a Mealy Bug or a Cottony Cushion Scale is an insect, for he will readily detect its six legs and the action of these as it crawls about. It will not, however, be equally clear that the round or oval fixed scales (which have lost their legs and do not move again once they have formed their scale) are just as truly insects and members of the same family.

If by the aid of a needle-point or penknife you raise the scale you will observe a mass of minute particles, which under a magnifier will prove to be so many tiny eggs; or, in the case of the San Jose Scale, you will find the body of the mother literally packed with young. I have counted as many as 1,500 eggs from a single specimen of the Vine Scale (*Lecanium cymbiform*). Some scales produce many generations each season; others, like the Vine Scale, have but one brood.

All scale insects are not oviparous or egg layers, although the majority appear to be. In the case of certain species they are viviparous, that is the progeny are born alive. Amongst the viviparous scales we have locally the Soft Brown (*Lecanium hesperidum*), Red Scale (*Aspidiotus Aurantii*), San Jose Scale (*Aspidiotus perniciosus*), and others. The young of scales when born or hatched will be found on observation to exhibit marked activity. This free life manifested by the scale insect at a period of its existence when it is still very small is the explanation of its apparent spontaneous increase upon plants, whereon its presence had previously escaped observation.

Persistent activity throughout life is not, however, a character possessed only by the Mealy Bugs, but is to a degree found to exist amongst the soft-bodied scales (Lecanidae), up to that period when the adult female is distended with eggs or young. Locomotion upon the food plant after this period ceases.

The Hard Scales (Diaspinae), which include the San Jose Scale and others, have no power of movement on the plant once the larva settles, inserts its beak, and forms a scale covering. The duration of the active life of members of this sub-family is limited to a few hours or days following its birth, during which it takes no food.

The mouth parts of scales are formed for sucking and are very long, often exceeding in length the body itself. This hair-like organ or proboscis is held deeply fixed in the tissue of the plant, and remains so during the entire stationary existence, forming a tube through which the plant sap is imbibed. The mouth is also the medium by which the scale establishes its injurious relationship to the plant that is of such importance to those interested in its successful culture.

We have now proved in a general way that a scale is a true insect, which is revealed while in the young larval stages of all species, and in some throughout life, and again with others by the structure of the winged male. The female has apparently become degraded, and possesses little else than the powers of destructive feeding, and reproduction.

We will now deal specifically with a single individual of this interesting group of insects, namely, the San Jose Scale (*Aspidiotus perniciosus*).

Original Home.—Every country in which this scale is found repudiates the honour of being the native and original home of this pest. Indirect evidence, however, points to Japan as the probable native place, it being introduced into other countries many years ago per medium of imported trees and plants. This goes to prove the necessity of the rigid quarantine laws which we now have, and to which some people bitterly object.

It first received its specific name at the hands of Entomologist Comstock in 1880, who assigned to it the very appropriate name "perniciosus," meaning highly destructive.

Life History of Scale.—From observations made, the following facts have been noted. The young or larvae are born alive, the eggs hatching within the body of the mother. They are very minute, lemon-coloured, active creatures. Each larva is furnished with two feelers or antennae, a long hair-like mouth, and six strong legs. When the young has found a suitable place on the plant in which to settle, it inserts its rostrum through the bark into the juicy sap beneath, and draws on these for its sustenance.

A waxy secretion from the outer parts of its body, combined with its cast skins, soon forms a covering known as the scale, under which the true insect lives. Instead now of the lemon-coloured larva we see a greyish slaty-coloured object. Even at this young stage the central nipple is generally quite prominent, though sometimes it appears to be wanting altogether. As the insect becomes more mature, the scale becomes darker, and the nipple when exposed slightly golden. Twelve days from birth the larva has its first moult, and with this casting of the skin the female loses her eyes, feelers and legs, while the male loses his legs and feelers.

The female scale becomes circular and flat, and at this period is slightly smaller than the male, whose scale has assumed an oval form. The male of all the circular Aspidiotus scales can always be determined by the oval form. About seven days after the first moult the male again casts his skin and appears with dark purple eyes and feelers and legs renewed. Two days after the male's second moult, the female goes through the same process. At 23 days from birth the male has his third and final moult. Three to five days later, or 26 to 28 days from birth, the adult winged male appears.

I have frequently observed this issue of the male, which is accomplished by the insect backing out from the rear end of the scale. The perfect adult male has two wings, prominent and beautiful antennae, conspicuous purple eyes and anal style, but lacks any mouth parts. He is in fact a most con-

ceited dude, and for this reason we need not be surprised at the lack of anything, even brains. He lives a short and merry life, but owing to the lack of a mouth misses many of its greatest pleasures. He has not even the joy of beholding his own progeny, as he dies before they are born. It may be as well for the family that they never knew their father, as they could not possibly take any pride in their shallow-pated progenitor. To return to the female (which is the one we have to fight, and which we left after her second moult), we find that at 31 or 34 days from birth she has her final and adult moult, and seven days later gives birth to living young. Thus we have a life history of four weeks in the case of the male, and roughly five weeks in the case of the female. The male, as before stated, only lives a few days after reaching maturity, whereas the female lives and reproduces for several weeks.

The mature females are very prolific, and according to Dr. Howard, of America, the average producing period of a female is six weeks, and the average number of young 400, or 10 every 24 hours. It has been estimated that a single female and her descendants under most favourable conditions, which fortunately are never obtained, would produce a grand total of three thousand millions in twelve months.

Pear showing typical discolouration of skin caused by San Jose Scale.

General Habits.—The arrangement or grouping of the San Jose Scale on the bark is often quite characteristic, and is frequently sufficient to fix their identity. In slight infestations they seldom have a tendency to cluster, but are scattered somewhat evenly on the bark. In badly infested orchards the presence of the scale on new growths, and fruit, produces a deep purplish-red colouration in the tissue under the epidermis.

When the scale is bad, it is not an uncommon thing to see them overlapping one another. Bark that is thickly infested has a grey ashy appearance, due to the presence of the large number of scales, and becomes rough and cracked. You can prove whether the scale is alive by crushing with a knife or the finger nail. If a yellow oily substance exudes, they are alive; but if no such oily liquid appears after pressure, they are dead.

How the Pest spreads.—In the first place, it is introduced into orchards primarily per medium of young stock, cuttings and scions. Birds and insects have been proved spreaders of this pest. When they alight upon an infested tree the young, active scale larvae crawl on to their bodies and are thus carried about. Man himself may be an agent in its distribution; when picking and working amongst the infested trees the young fall or crawl on to his clothes, tools, utensils, etc., and are thus conveyed about. Infestation from tree to tree is often accomplished by the blowing about of the tiny larvae. It has been noted that the scale will spread in the line of the prevailing winds. Infested fruit packed and sold about the country is a possible means of spreading the scale. Growers need to be most particular in this regard, especially when dealing with export fruits, lest they create a prejudice in the minds of importers in other countries against our entire crop, from the fact that it would be branded as coming from an infested country. In fact, many countries have already declared an embargo against the introduction of fruit and plants found to carry this scale.

To show the necessity for our taking action against this pest, I quote the remarks of Mr. Walter Collinge, Director of the Research College Laboratory, Birkhamsted, England: "That without the most rigid measures it will be impossible to prevent the introduction of this and other pests. Why does England not at least insist on having certificates from authentic bodies, declaring freedom from San Jose Scale, as is demanded by many other smaller countries."

Climatic Conditions.—As a factor in the spread and increase of this pest, I have observed for some time that there must be other conditions than mere food supply that determines the abundance of scale insects in any particular region. As mentioned earlier, this scale has not proved to be as serious a pest in this State as it has in other countries, for which we need to be thankful. It is possible, even probable, that differences in the amount of humidity are of greater importance than extreme temperatures. Short, cool summers with relatively high humidity may keep the scale in check. I think, however, the most likely local climate factor is the period of dryness, with intense summer heat periods, which occur during most local summers. The same conditions of hot dry winds have a similar effect on the Woolly Aphis. There are no known specialised natural enemies which concentrate upon it.

Parasites.—A casual internal chalcid wasp is bred out under cage conditions, and several species of ladybirds have been noted feeding spasmodically upon it. Although it has been proved not to be so serious a pest with us, we must not let it get away from our control, as we do not know what a season may bring forth with regard to insect pests.

Extermination, when once the pest has got a start in an orchard, appears to be well-nigh impossible, although we have local records of its having been wiped out when taken in time; but generally speaking, this is not so.

While, therefore, one is undoubtedly justified in asserting that the San Jose Scale is to be a permanency, it by no means follows that the profitable growth of deciduous fruits is seriously menaced on this account. Experience

here and in other countries has abundantly demonstrated that this scale insect can be controlled.

In other words, by proper treatment, the value of which has been demonstrated by much practical experience, an orchard may be protected from serious injury and kept in a good paying condition so far as influenced by the San Jose Scale.

Treatment.—This was given by the Officer in Charge of Fruit Industries in the last issue of the Journal. It will not be amiss, however, to requote his instructions, which are as follows:—

"All deciduous trees throughout the orchard must be thoroughly sprayed, while the trees are dormant, before 7th September, 192 , with one of the following:

"(a) Registered brand of commercial lime sulphur wash at a strength of one gallon of the stock solution in seven gallons of water; or

"(b) Home-made lime sulphur wash made up of 53 lbs. freshly burned lime, 100 lbs. sulphur, 50 gallons of water. This is a stock solution and must be used at a strength of one gallon in seven gallons of water; or

"(c) Registered brand of prepared spraying oil used at a strength of one gallon of spraying oil in 19 gallons of water."

NOTE.

The Department strongly recommends—

(i) "That when an orchard is badly infested with San Jose Scale two sprayings should be applied while the trees are dormant—the first spraying to be completed before 30th June, the second before 7th September.

(ii) That when an orchard is infested with Red Mite in addition to San Jose Scale, prepared spraying oil should be used for the first spraying, and lime sulphur for the second."

The spray kills the scale not only by direct caustic and suffocation action, but also leaves a limy coating on the trees, which remains for a long time and thereby protects the trees against any young that may issue from adults which escaped the winter treatment. The lime sulphur spray should always be well strained and kept agitated when used.

In applying lime sulphur spray to some varieties of apples it has been noted that the hairy nature of the terminal growths prevents the wash from coming in contact with the scales. Scales which are so situated often escape, owing to this hairy protection.

The young from these naturally crawl upwards on to the new unsprayed wood, or, in the case of spurs, on to the newly formed fruit. The result is that trees which have been well and thoroughly sprayed may develop and exhibit scale and badly scale-marked fruit. In such cases it is advisable to spray the terminals early with an approved oil spray, which has greater penetrating power. The wear on pumps and nozzles can be kept to a minimum by carefully washing the apparatus promptly after use.

When spraying, wear only the oldest clothing and protect the exposed parts of the body as much as possible. Some oily substance rubbed well over the hands and face will protect the skin from the burning and skin-cracking effect of the spray. As before stated, lime and sulphur wash is not only an insecticide, but also has the virtue of being a valuable fungicide.

In conjunction with spraying, orchard sanitation must be practised. Neglected, non-pruned and starving trees are always more susceptible to insect pests than healthy, well-kept trees.

It has often been demonstrated that the scales belonging to the Aspidiotus group always multiply more rapidly on a tree or plant that is in poor condition. The scale is blamed for the condition of the tree, but in nine cases out of ten, I venture to state, the tree when attacked was in a poor state and hence had no resistance. This would result in the rapid increase of the scale and naturally a more rapid decline of the tree or plant.

Healthy trees or plants, combined with orchard sanitation, is three parts of the battle won.

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PERENNIAL VELDT GRASS.

(*Ehrharta calycina*, and related species.)

W. M. CARNE, F.L.S., and C. A. GARDNER.

The *Ehrharta* grasses are indigenous in Africa, where there are about 25 species, mostly South African. Three have appeared in Western Australia—the Perennial Veldt Grass (*E. calycina*) and two annual species (*E. longiflora* and *E. brevifolia var. cuspidata*).

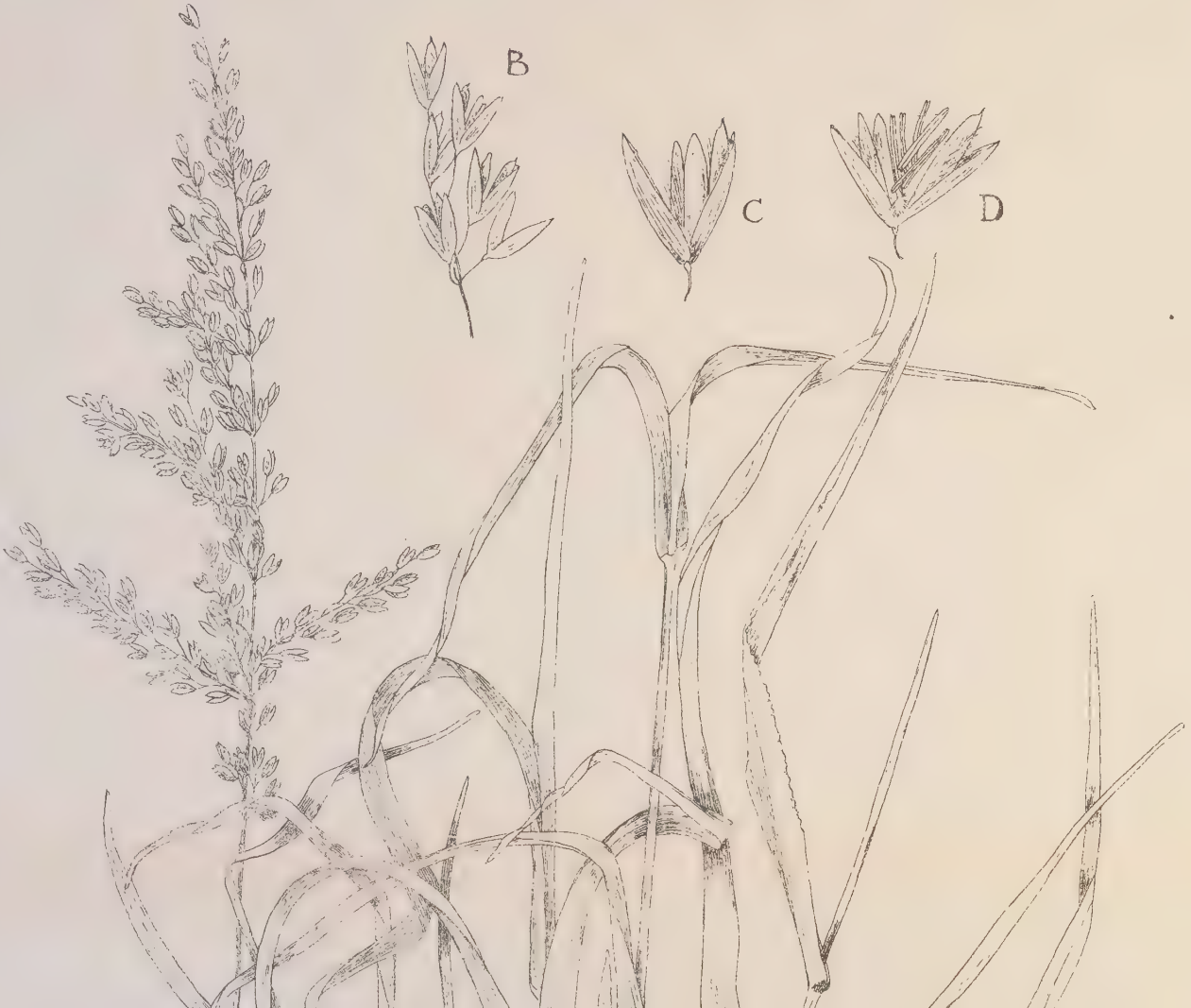
PERENNIAL VELDT GRASS.

This grass has lately attracted considerable attention through its apparent ability to withstand well our dry summer months on light sandy soils at Crawley. Seed has been sown in small quantities, and large quantities of roots have been planted on sandy coastal soils, especially by the Group Settlement Department on the Peel Estate.

This grass has been long established around Crawley from near the water's edge up the slopes of King's Park. Its invasion of the park has been most marked of recent years, and the purple heads are giving quite a distinct aspect to the invaded area from November to January. It appears to thrive best on uncleared tuart sands, growing vigorously and making a dense stand in the shade of trees or close to stumps, logs, Macrozamia palms, etc. In the open the plants are smaller and more scattered. It has managed to survive even in the metal of the train tracks. To a lesser extent it has been found near the river in South Perth and in patches along the railway line as far as Guildford, where it occurs on red clay soil. In habit it is tussocky, in shady places making a soft luxuriant growth in clumps over 18 inches wide and 12 to 18 inches high, excluding the flower stalks. In normal seasons most of the growth is made from August to November, flowering from November onwards. With summer and autumn rains new growth is made. This season a considerable amount of growth and a limited amount of flowering occurred following the April rains. Germination appears to occur normally with the first winter rains. In the open the stools are small and the plants dry off sooner after flowering, but a certain amount of green herbage persists at the base of the dry flowering stems. The grass appears to be eaten readily by stock.

It is difficult to predict its future usefulness. Seed ripens unevenly, and the results from sowing it are not yet definite enough to prove whether we can rely upon this method of propagation. The sowing of roots obtained by the breaking up of strong stools appears to be more certain, but the results of the extensive plantings on the Peel Estate should decide this. Observations on the grass as it occurs strongly suggest that it should be planted in uncleared sandy soils on the coastal plain.

Description of Plant.—A densely tufted tussocky plant with rooting tillers spreading to a diameter of about 18 inches and about two feet in height without the flowering stems. Stems usually bent near the base, slender, smooth, hairless, four to six noded (jointed), the sheaths rather tight. Ligules very short, obtuse, toothed; blades long and narrow from a clasping base, the lobes of the base purple, contrasting sharply with the green of the blade and sheath. Panicle narrow, nodding, three to nine inches long, the stem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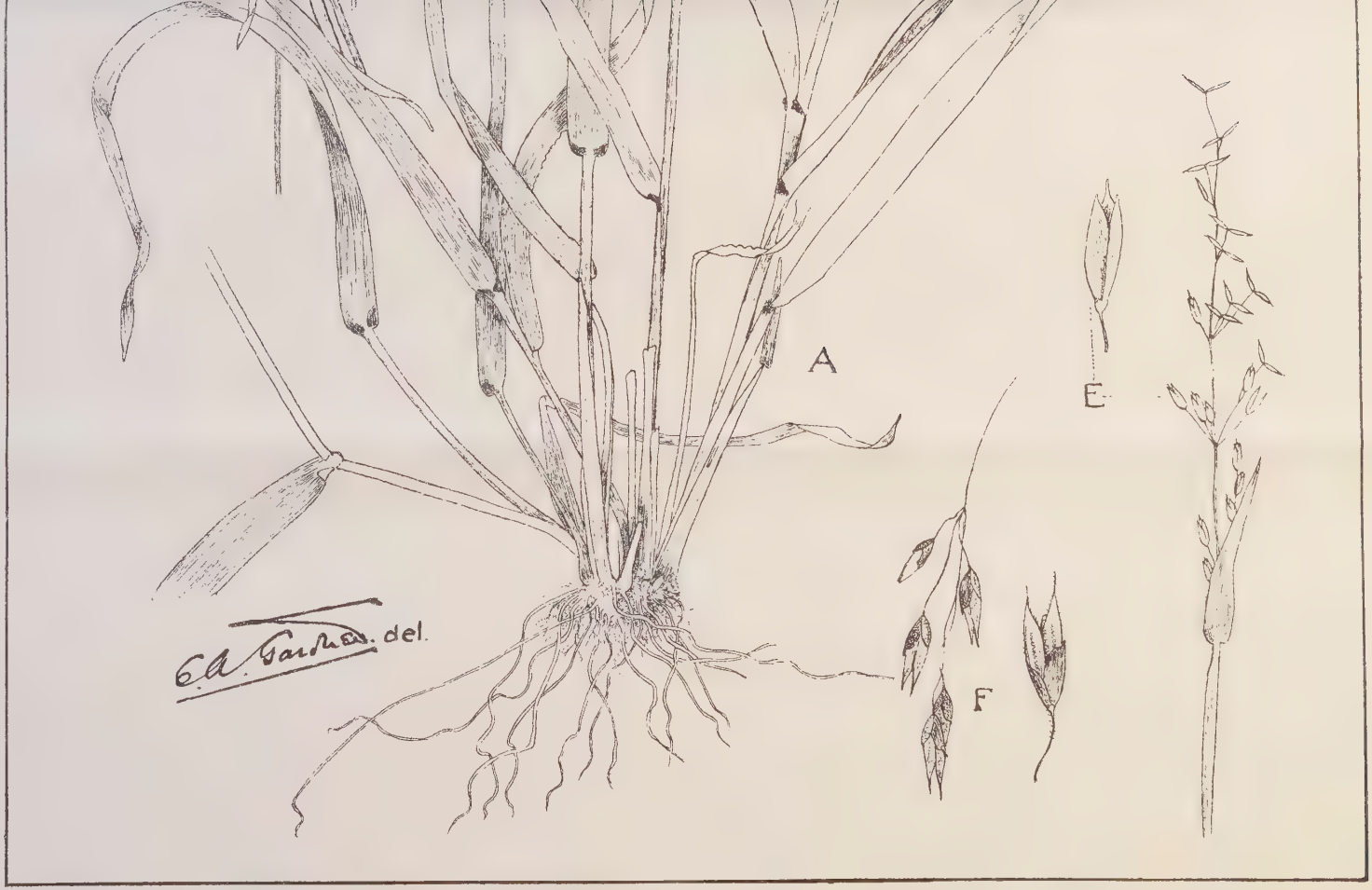


PERENNIAL VELDT GRASS: (*Ehrharta calycina*, Smith.). CRAWLEY, 1926.

slender, the branches clustered at intervals, very unequal, spreading or erect, threadlike. Spikelets pale violet-purple or paler, small with almost equal glumes. Flowers three in the spikelet, the lower two reduced to empty valves, the uppermost hermaphrodite; stamens six.

The large panicle of small purple flowers, together with the perennial and tussocky habit, distinguish the Perennial Veldt Grass from the two annual species. Of the two latter, *E. longiflora* is tall and erect, with broad dark green leaves, long drooping flowers, the outer purple glumes being much shorter than the light-coloured inner ones, which are very acute; stamens six. *E. brevifolia, var. cuspidata* is a smaller plant of a more stooling habit and pale green short leaves; the panicle (see plate) is small and narrow, with very small spikelets, the upper empty glume shortly pointed; stamen one.

ANNUAL VELDT GRASSES.

Ehrharta longiflora.—This is common on sand around Perth, especially on roadsides, at least from Bullsbrook to Bunbury, and occurs to a limited extent both north and south. It is of an erect tussocky habit, with drooping rat-like heads, with dark purple patches at the base of the spikelets. Like the perennial species dark purple patches also occur at the basis of the leaf blades. Though a good food plant, it is essentially a winter and spring grass, flowering in August and September and dying with the advent of summer. It is a common weed of metropolitan gardens.

Ehrharta brevifolia, var. cuspidata is another annual winter and spring species, smaller in every way, less erect, and more spreading than *E. longiflora.* It has the widest range of the three, occurring in pastures on sandy soils at least as far north as Gingin, as well as around the metropolitan area, where it is a common weed of gardens and lawns.

THE QUEENSLAND STATE CANNERY.

By the EDITOR.

During the past decade Queensland, like other States of the Commonwealth, was called upon to solve the problem of repatriating thousands of its soldiers, returning after years of absence to a country whose economy had been so disturbed as to render their absorption a matter of some difficulty. But Queensland, like our own State of Western Australia, was fortunate in the possession of large tracts of undeveloped cultivable land. What, then, could be more natural than that utilisation of these should have first call over all schemes for incorporating into civil life again the returning flower of her manhood.

Amongst projects which assumed definite form were those of a Soldier Settlement Group at Beerburrum, a beautifully situated spot in the Blackall Ranges, some 40 miles North of Brisbane, admirably suited to the cultivation of pine apples, and a similar settlement for the production of such fruits as apples, plums, peaches, and tomatoes in the region of Stanthorpe, 197 miles South of the Capital. The proposers of these settlement schemes were not, however, unmindful of the fact that production, to be sustained as a contribution to general prosperity, must run *pari passu* with profitable markets. Past experience, combined with a knowledge of the prolific growth engendered by the soil and climate of these districts, postulated abundant harvests which would soon over run the local demand. Indeed, before the incidence of these settlements there had been frequent occasions when pine apples selling at the ridiculous figure of one shilling per case, containing from 21 to two dozen of the fruit, gladdened the heart of the urban dweller while it cast a gloom and depression upon his rural neighbour, leading to a wasteful spectacle of luscious crops rotting on farm and siding.

It is not the purpose of this article to deal with the merits and demerits of State *versus* Private Enterprise, nor would we attempt to excise from the preserves of polemists this favourite allotment of their demesne. It is sufficient to record that the Government of Queensland realising that a production without a sufficient market would be neither ornate nor advantageous, and considering undue hesitancy the precurser of disaster, acted promptly, and the Queensland State Cannery was the outcome.

Since operations were commenced in 1920, it may be conceded that the objective of this enterprise has been achieved. It is not claimed that a monetary gain has been the result of work done to date. On the contrary, a loss is admitted as judged by the prosaic pages of the ledger. It is contended, however, that this is not an economic loss inasmuch as the land has benefited by closer settlement, the producer has obtained a better market for his wares, and the cannery has given employment to a number of people and an impetus to currency circulation. If it be objected that the consumer pays more for his fruit than in the bad old days when supply and demand were left to regulate themselves, it must not be ignored that in those times the grower was deprived of the just reward of his labours. If the taxpayer be called upon to make good a deficiency on working costs is it not better that he should do so, remembering that he is getting something in return

for his outlay, than that the producer should be reduced to the bread line and probably driven from his holding to swell the ranks of the unemployed whilst his land reverted to its primitive state?

That the producer has benefited is apparent. The cannery does not interfere with legitimate competition, but confines its operations to surplus fruits. As demonstrating this it may be mentioned that the estimated cost of producing a case of pine-apples is between 5s. and 6s., while some 600,000 cases were last year sold at an average return of 8s. to 9s. each, and the State Cannery was able to take the whole of the available surplus at 4s. 3d., returning the case to the grower—a no inconsiderable factor in the successful pursuit of his avocation.

But the pine apple crop alone would be quite insufficient to maintain the cannery. The summer pine apple season usually runs from eight to nine weeks, and the winter crop, beginning about June-July lasts until September. As an auxiliary it has therefore been found necessary to turn attention to the jam and sauce trade, and this has now been developed to such a good steady carry on that the plant is never idle, while the Stanthorpe settlers obtain a market for their surplus fruits used in the manufacture of these preserves. During the past four years this trade has increased three fold, and the jam turnover alone is said to be worth £100,000. In fulfilment of the object for which the works were established preference is, of course, given to returned soldiers in the purchase of fruit by the cannery. A gratifying and significant feature in connection with the works' output lies in this: although a demand has been created in overseas markets in recognition of the high standard quality maintained, the export trade is extremely limited, for the Queenslander patronises local produce not only because it is an excellent practice, but because he prefers the goods. Therefore the local market absorbs nearly the whole of the cannery's output.

Under the guidance and courtesy of the General Manager, Mr. Galt, and the Works Manager, Mr. O'Donnell, the writer had an opportunity of recently inspecting the factory, where some 60 persons are permanently employed, and during the busy season the staff is increased to twice that number. Everything conceivable appears to have been done for the elimination of waste labour and the preservation of purity and cleanliness. Fruit is delivered to the plant at a siding connected with the railway system, thus minimising handling charges, and the work of conversion to its ultimate preserve is immediately commenced. It is noteworthy that once unpacked it never again comes into contact with the bare hands before it is placed on the market, as during the course of processing all paring, coring, slicing, pulping and canning are automatically contrived. It would be impossible for a layman to adequately describe the machinery employed and the manner of its operation, and if this could be done it would doubtless interest only the technologist; but let us attempt to describe one instance only, that of a melon on its way to become part of the delicacy known as "Lemon and Melon." Thrust end on to a projecting live spindle it is withdrawn, whilst revolving, into a series of knives set cylindrically, and is divested of its peel very rapidly, being then dropped to a conveyor which carries it to another machine where it is mechanically sliced and cubed. The preparation is then transported to a chute down which it is fed, mixed with the correct proportions of its component fruits and sugar, to a huge cauldron heated by

electricity. Boiling then takes place and may be of short or long duration, bubbling fiercely or simmering quietly according to the requirements of the operator who controls the temperature gauge. Cooking completed the preserve is conveyed to a distributer beneath which passes an endless chain of empty containers. The timing of the endless chain and distributer tap are so synchronised that immediately one of these vessels receives its apportioned quantity of fruits and juices the flow is automatically shut off, whilst the chain moves the next tin forward, and directly underneath the orifice, which again opens, the flow continues, and so the procession of cans creeps on until each reaches the end of its journey. Here a perfectly fitting lid is dropped mechanically into place and tapped firmly home. The container revolves for a second whilst a pencil point deposits a thin ribbon of composition around the circular edge of the lid, hermetically sealing it, and is then gravitated to a hot water bath where all overflow substance is washed from the exterior, it is wiped clean, placed with others on a stand and eventually wheeled away to the labelling and packing room. The whole operation from the time the fruit leaves the cauldron until it is ready for the packing room occupies but a brief space of time, and as the process is continuous it may be readily imagined that a huge output can be maintained when required.

In one or two instances, such as the removal of pulp from Seville oranges, the fruit has to be handled, in which case the operatives are provided with thin rubber gloves and spoon-shaped instruments with sharp cutting edges.

Everything in the factory is scrupulously clean, and the brightly polished machinery and copper cauldrons present a sight pleasing to the eye. The cannery seems to be replete with every accessory for the manufacture of its products and their disposal. In one section of the building is an up-to-date plant where tin plate is cut to shape and size, pressed, rolled, and transformed into receptacles of various design. In another room piles of local timber are stacked and machine made into neat packing cases. Alluring labels, turned out by the Government Printery, are a credit to skill and artistry and serve excellently their purpose of advertising the contents of the container. The plant is capable of manufacturing cans at the rate of 24,000 per day, and the pine apple preserving equipment can output 40,000 apples daily. Of this production the Queensland fruit compares favourably with the Hawaiian standard, which is recognised as the best in the world.

As an accessory to the Queensland State Cannery there is a branch establishment for pulping at Stanthorpe, which considerably facilitates handling the produce from that district.

These works have undoubtedly given a stimulus to the fruit-growing industry in Queensland, and pine apple land at Redlands runs in value from £200 per acre upwards, and is suited for the growth of bananas and custard apples as well. Elsewhere the value varies from £80 per acre upwards. It is essential that the land be situated near the coast line and sure of a heavy rainfall, while the plants last from five to seven years, and 350 cases of pine apples to the acre is considered to be a good crop.

There is much food for reflection in the operations of the Queensland State Cannery. Originated as an adjunct to Soldier Settlement it has proved its utility in land development and industrial progress. With large sugar

plantations the State has doubtless a double objective which could not have a general application throughout the Commonwealth, nevertheless orchardists of this State who have experienced disastrous seasons through glutted markets, vexatious delays of transport, and other depressing circumstances, would do well to ponder on the achievements of the Queensland venture. Does the matter call for co-operation on their part? and would not intelligent concentration of thought lead to the evolution of some scheme on similar lines whereby surplus crops could be utilised to their advantage whilst establishing an industry which, besides creating employment in itself, would lead to greater settlement of our horticultural lands and help to bring about that increase of population which Western Australia so urgently needs?

An able man is a man who can do things, and his ability to do things is dependent on what he has in him. What he has in him depends on what he started with, and what he has done to increase and discipline it.—Henry Ford.

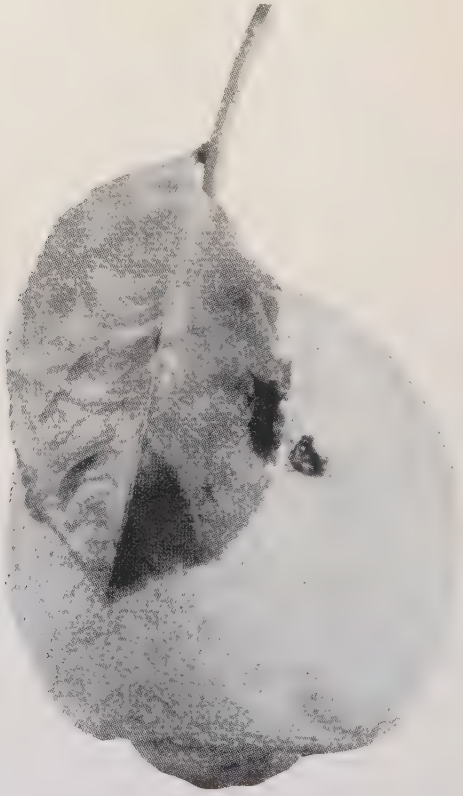
CITRUS PIT.

(*Pseudomonas citriputeale*, C. O. Smith.)

W. M. CARNE, F.L.S,
Plant Pathologist and Botanist.

This is an old established bacterial disease, which in most seasons is of little importance.

First described by Smith in California in 1913,* it was recognised in South Australia in 1924,† and is now recorded for the first time for this State.

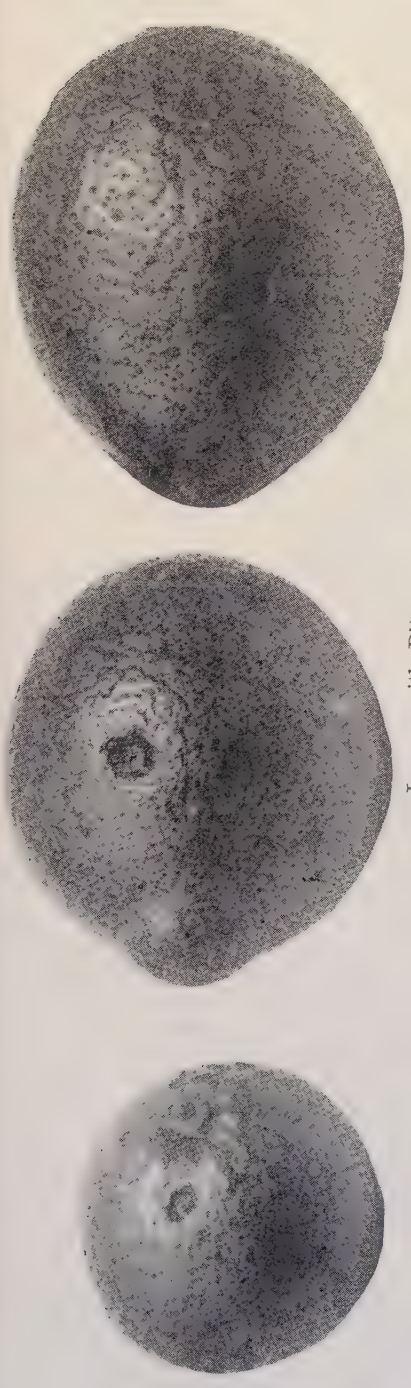


Lemon fruit and leaf with Pit.
(After Fawcett, Horne, & Camp.)

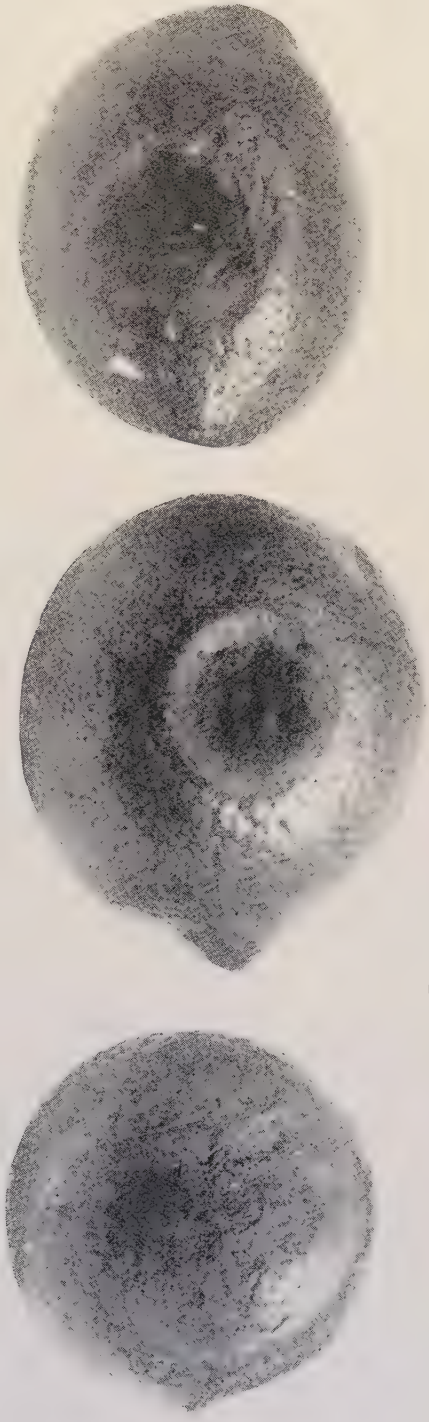
Citrus Pit occurs most commonly on lemon fruits, and to a lesser extent on oranges and mandarins. With us lemon leaves are apparently more frequently attacked than those of oranges or mandarins, though the reverse

* Smith, C. O.—Black Pit of Lemon—Phytopathology III., 1913, pp. 277–281.

† Lewcock, H. K.—Prelim. Note on a Citrus Bacteriosis in South Australia—A.A.A. Science XVII., 1926, p. 746.



Lemons with Pit.



Lemons showing rotting due to fungi following Pit

appears to be the case in California.‡ There the twigs are also affected, and to this and the leaf attack the name Citrus Blast has been given. Twig attack has not been noted here.

Oranges with Pit

On lemon fruits the spots are depressed, dry, circular or oval, reddish-brown, brown or black, from very small up to three-quarters inch in diameter. Under wet conditions, especially the abnormally wet conditions of this year,

‡ Fawcett, H. S., Horne, W. T., and Camp, A. F.—Citrus Blast and Black Pit—University of California, Agric. Expt. Stn. of College of Agric. Technical paper 5, 1923, pp. 1-24.

secondary organisms such as Blue Mould, Dieback (*Colletotrichum gloeosporoides*) and Sour Rot (*Oospora citri-aurantii*), may extend the affected area over one-half the fruit or more, and cause a soft rotting. Under more normal conditions the spots are hardly conspicuous enough to seriously affect the sale of fruit.

On oranges and mandarins the spots are usually reddish-brown and smaller. They may run together, however, and form irregular dry brown areas. The past winter was associated with a good deal of infection on the orange, but for the past few seasons mandarins, especially Beauty of Glen Retreat, have been more generally affected.

The spots are confined to the rind of the fruit, and the edible portions are not affected unless secondary infection follows the primary attack. Indeed it may be said that the disease is only of importance when climatic conditions favour the secondary rotting organisms.

On leaves, infection is indicated by a blackened area, usually on the side or tip but occasionally central. There is a similarity to the leaf trouble caused by Brown Rot, but the edges of the blackened areas are less distinctly defined. The affected areas tend to dry and crack, and the leaves fall readily.

Experiments indicate that infection can be readily obtained when the tissues have been broken by pricking or otherwise injured. Attempts to infect sound fruit have failed. This is in conformity with the American experience ‡ that the bacterium is essentially a wound parasite rarely, if ever, able to penetrate sound tissues. Fresh scratches and rubbings while the fruit is wet, with moderately low temperatures, ensure ready infection. It follows, therefore, that the trouble will be greatest in orchards exposed to much wind during wet winters such as the past.

American investigations have shown that bushy compact trees are less liable to wind injury than those of more straggling growth. It has also been found that a spraying with a bluestone fungicide in the autumn is to a large extent effective. As this coincides with the April or May spraying recommended for Brown Rot prevention, we have a further argument for the use of Bordeaux (4.4.50) or Burgundy mixture (4.6.50) on citrus trees in the autumn.

The Supreme purpose of my heart is not to be learned, rich, famous, or even "good," but simply to be radiant. I desire to radiate health, cheerfulness, calm courage and good will.—"Judge."

TRAPPING BLOWFLIES.

L. J. Newman, F.E.S., Entomologist, and
J. Clark, F.L.S., Assistant Entomologist.

There are several species of blowflies that are troublesome in their season and districts. The worst periods are mid-April to end of May, and mid-September to mid-November. Some years they appear earlier, others later, their appearance being governed largely by the weather conditions. There is no period of the year when it can be said there are no blowflies, but the periods mentioned are the times of the year when they are most numerous and destructive.

With the increase of our flocks and herds and rural populations, the blowfly control is becoming more and more a matter of concern. There is nothing more objectionable in country life than the presence of swarms of blowflies in the house and about the outbuildings. They not only attack the food, but may be the means of carrying and spreading disease. From a commercial point of view their menace to the sheep industry is of great importance.

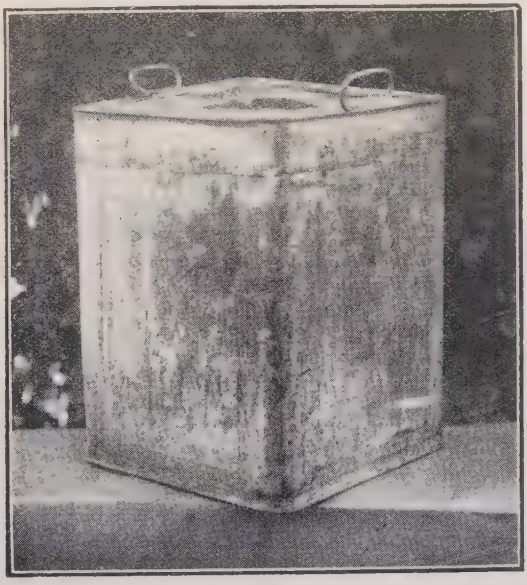
The control of blowflies is not a simple or easy matter. For the most part the maggots of these flies live in decaying and fermenting animal matter. By nature they were intended as scavengers, and thus help to rapidly destroy and break down this material. In our efforts, however, to increase the yield of wool, man has evolved types of sheep which grow wool containing much yolk; all sheep to-day coming more or less under this category. Further, the long wools collect the natural droppings and thus become dirty with animal matter. The presence of this yolky dirty wool gives rise, especially after a shower of rain in humid weather, to an attractive odour. This brings the flies, and stimulates them to deposit their eggs or living larvae upon the wool. This is a habit not natural to the fly but acquired as the result of the growing of the yolky wools. The maggots work down to the surface of the skin of the sheep and in many instances, by their irritation, break the skin, and if not destroyed cause the death of the animal. Animals so infected suffer a very painful ending.

It is recognised, of course, that the first essential in the control of these and other flies is farm sanitation. It is of little avail trapping flies in one area if in some other, flies are breeding in their countless thousands in carcases of dead animals or in manure piles. These mediums of propagation should be got rid of by burning, burying, or spreading the manure twice a week. With a view to the destruction of blowflies that have been bred as the result of neglect of others, the Entomological staff have been engaged for some time upon the testing of various types of blowfly traps. The trapping of the adult flies is one important method of control, but must be understood to be only supplementary to farm sanitation. There is always the danger that the flies captured may have done considerable damage before being lured into the trap. The old adage "Prevention is better than cure" is very applicable to this problem.

TYPES OF TRAPS TESTED.

South African, Australian, and Western Australian.

In most fly traps so far invented the general principle has been much the same. It has been the adaptation of a cone or pyramid of wire gauze, having a wide opening at the base and a small aperture at the apex. The bait or lure is placed immediately under the cone, or else the cone is made to fit over a receptacle containing the lure or bait. The flies can readily gain access to the lure, but once inside, the natural tendency is to rise upwards towards the light. This rising of the flies leads them through the small opening at the apex of the cone into the larger chamber where they are held captive. The ideal trap is one that can be easily and cheaply made, and is durable and efficient. In these experiments we have tested the South African, Australian, and various types of Westralian traps. Those types which proved to be of lesser value were discarded. The tests herein recorded refer therefore to the two traps, South African and West Australian. Early in the tests it was found that the old Australian trap with inverted cone was not in the running when compared with the South African and West Australian type, and was therefore abandoned.

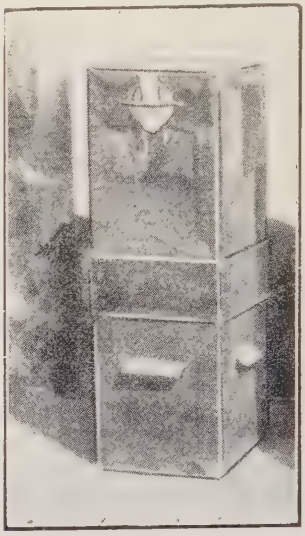


Australian Trap. Discarded.

In the tests made by this office the control trap was the South African improved type.

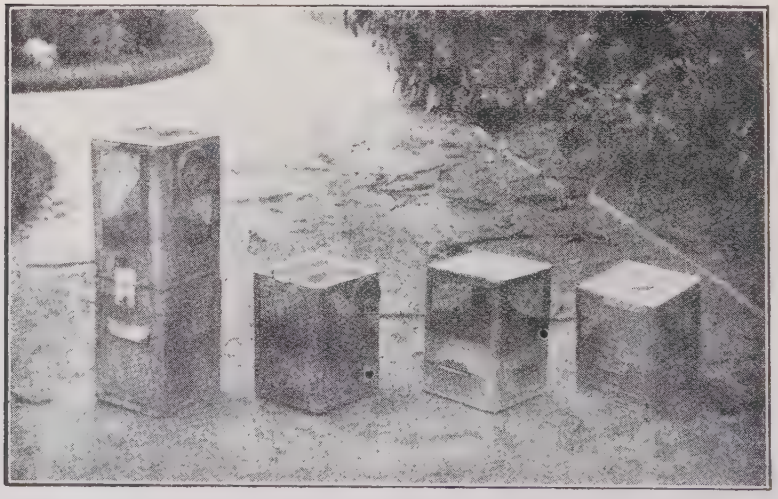
Many designs were made, but each in turn was discarded for better. Finally, we have evolved a very satisfactory type, which in our official tests has given better results than any other. The trap we have designated the "West Australian Blowfly Trap," was designed and made in the Entomological Laboratory. In one trap of this pattern we captured no less than

118,000 blowflies (nine species) between the 15th April and the 14th May. This is a period of the year when flies are very numerous. During the same period the South African trap was responsible for a capture of 82,000,



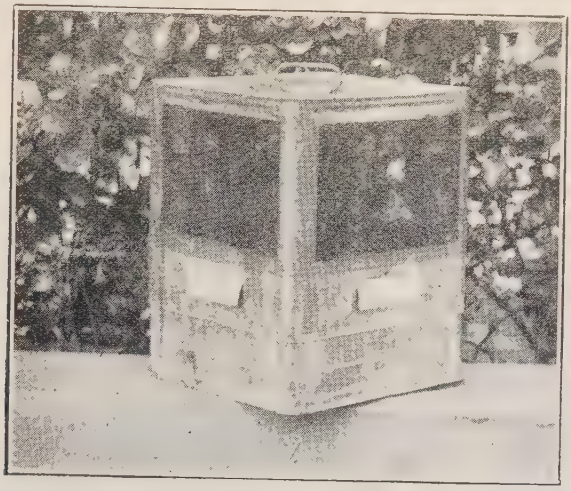
Improved South African Trap.

making a grand total of 200,000 for the month. The traps were similarly baited and set under the same conditions. The bait was renewed every 10 days, and the captured flies counted each week. The trapping of this enormous number of blowflies within 200 yards of the laboratory is somewhat

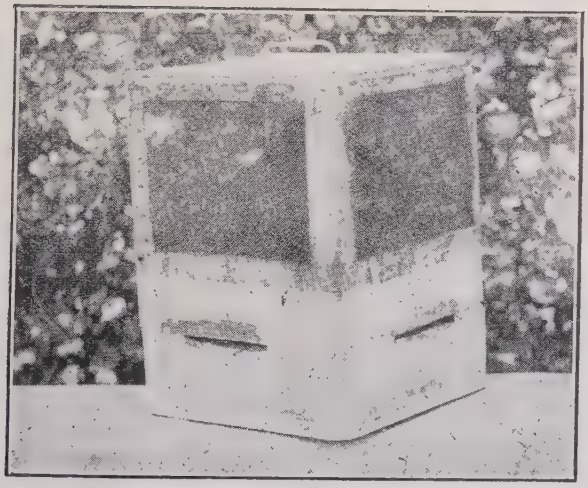


Four Types of Traps. From left to right: Improved South African and three types of West Australian.

astonishing, and is a demonstration of what effective destruction of this pest could be accomplished by the general use of these traps. The common house fly and others can be lured in the same way by the use of an attractive medium.



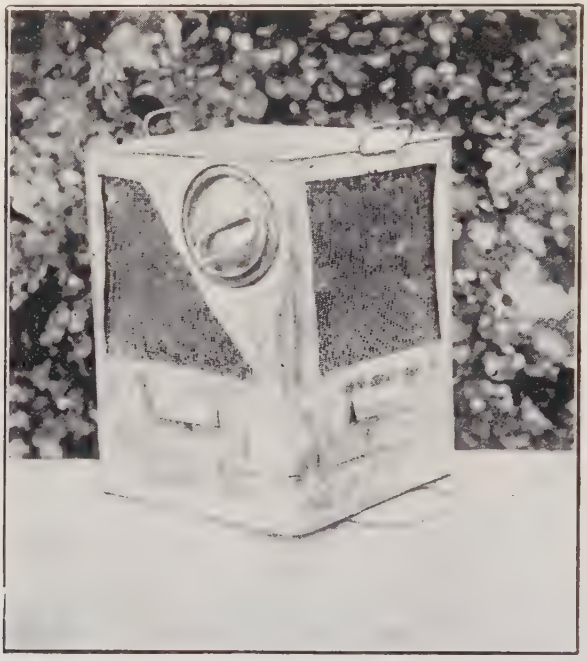
West Australian Type, movable cone. Discarded.



West Australian Type, movable cone. Discarded

How to make the West Australian Trap.

It is composed of three parts—fly chamber, cone, and reservoir. Take a petrol tin, remove the bottom completely and hammer out rough edges. Then punch eight small holes opposite each other down two sides of one corner to within three and a-half inches of bottom. Along each of the four top edges punch six opposite holes, equal distances apart. These holes are made for the purpose of permitting the fly gauze wire to be sewn on with copper wire. Having made these holes the top and four sides are removed,



West Australian Type, fixed cone. Discarded.

leaving a margin of one inch on top and sides and three and a-quarter inches bottom all round. The next operation is to cut a strip of fly wire gauze three feet long by 11 inches wide and fix into position. This is done by wrapping the gauze around the outside of the tin and fixing the two ends by means of wire staples. The staples are pushed through the holes previously punched for this purpose. The top edges are likewise sewn on or stapled on, the wire being pushed through and clinched in the inside. For the top a portion of gauze to fit is cut and sewn or stapled on.

This completed, a wooden stop three-eighths inch by three-eighths inch is nailed into position three and a-quarter inches from bottom all round inside This stop will be level with the top edge of the bottom cut. Tack same into position from the inside, using one-inch soft nails. These nails pass through the wood, tin, and gauze. They are bent over on the outside, and thus hold the bottom edge of gauze in position.

The making of the cone frame is the next thing to do. Take four pieces of wood one and a-quarter inches by three-eighths inch, and construct to fit the inside square of the trap or tin. To this wooden frame the gauze cone is tacked on the inside. This frame, with cone attached, is movable, and is inserted into the tin until it comes in contact with the wooden stop previously fixed. Across from side to side of cone frame nail one strip of wood one inch by a-half inch. This is used as a grip to pull the frame and cone out when requiring to empty the trap of flies. The fact of the movable cone does away with the need for any opening in trap for emptying out the flies. All that has to be done is to kill the living flies by means of a flame of dry grass, litter, or paper. The cone is then withdrawn and the dead flies emptied out.

How to make cone.—It is best to cut out a paper pattern and then cut the gauze to coincide with it. The cone or pyramid has four sides to it to correspond to the four sides of the trap. The *modus operandi* is as follows:—Strike out a circle on your paper having a 12-inch radius. Measure off on this circle four sections eight and a-half inches long. Draw lines from point to point on the circle, and from each point to the centre. This will give the square eight and a-half inches base of each side of cone, and the centre 12-inch lines indicate where the folds of cone are to be made. A margin three-quarters of an inch wide is left on the fourth side for the purpose of connecting and sewing up with side number one. Do not cut off marginal edges left between the connecting loose lines, as these portions of gauze are required to nail on to cone frame. The completed cone is then tacked on to inside of frame. To admit the flies to trap chamber it is necessary to make a small hole in the apex or top of cone. This is easily done by forcing through a sharpened lead pencil, thus making a hole of the required diameter. The hole should not in any case exceed the diameter of an ordinary writing pencil. To those requiring a ready-made full-size pattern of cone, same may be had on application to the Department of Agriculture.

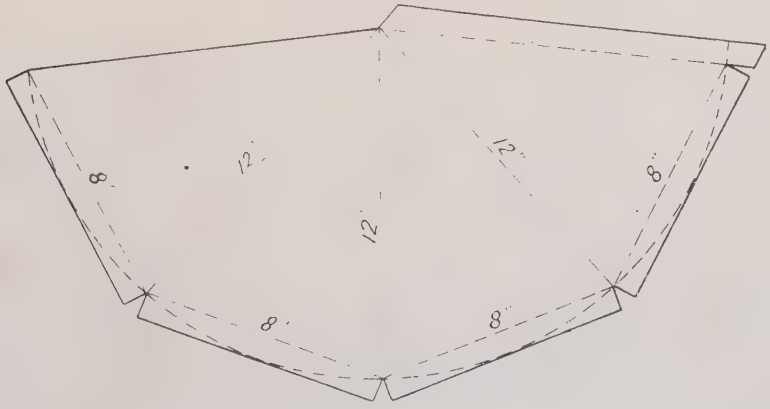
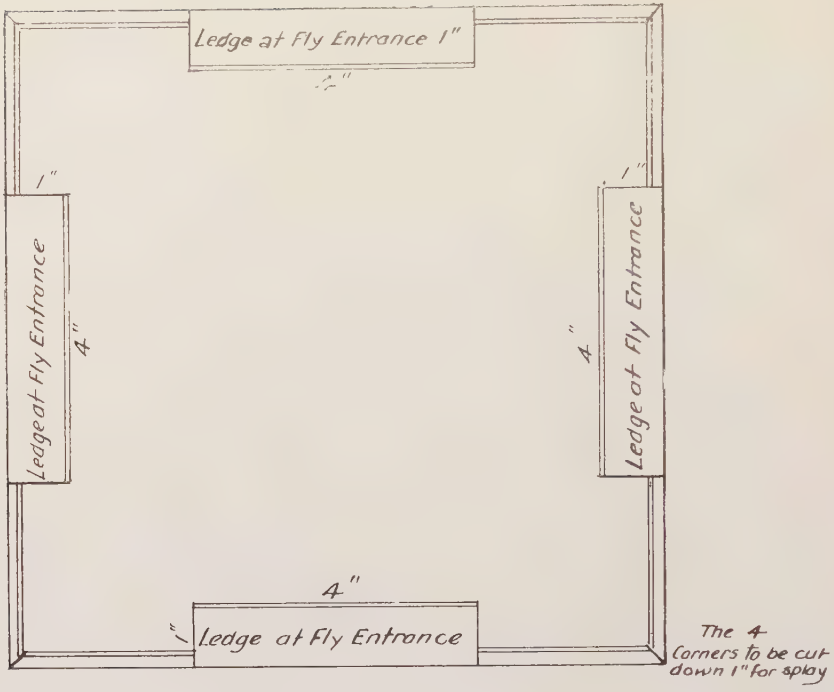
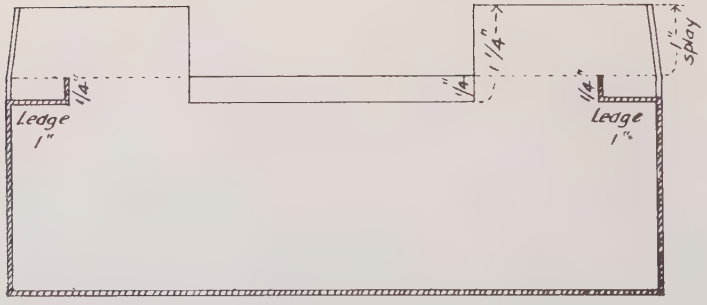


Diagram of cone.

Reservoir.—This is the third section of trap, and is used for the holding of the lure or bait. To make this portion a second tin is needed. This tin is cut off four inches from the bottom, the balance being discarded. In the centre of each side make two cuts one and a-quarter inches deep and four inches apart from the top edge downwards. The portion of tin between



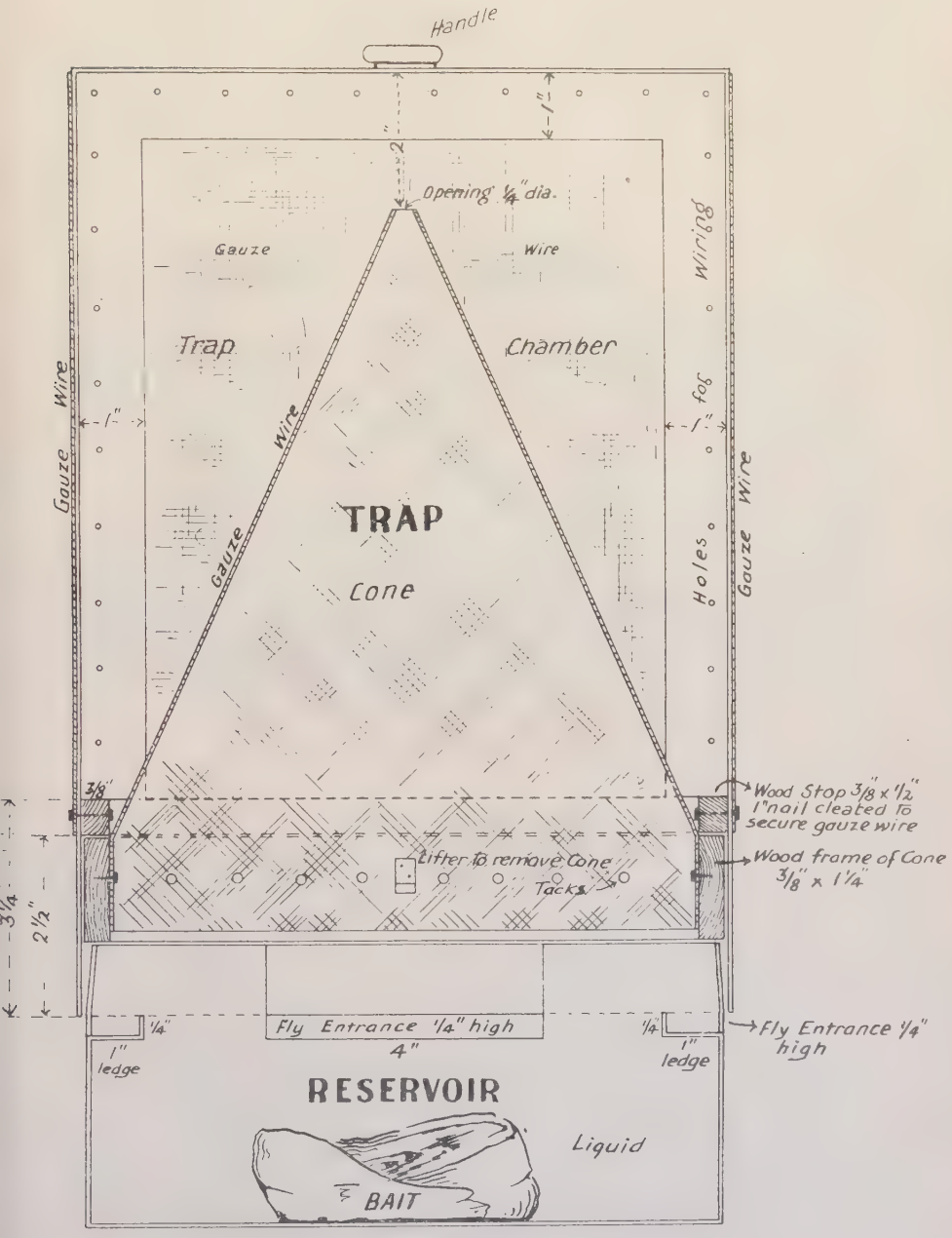
Plan



Section

Shewing construction of Reservoir

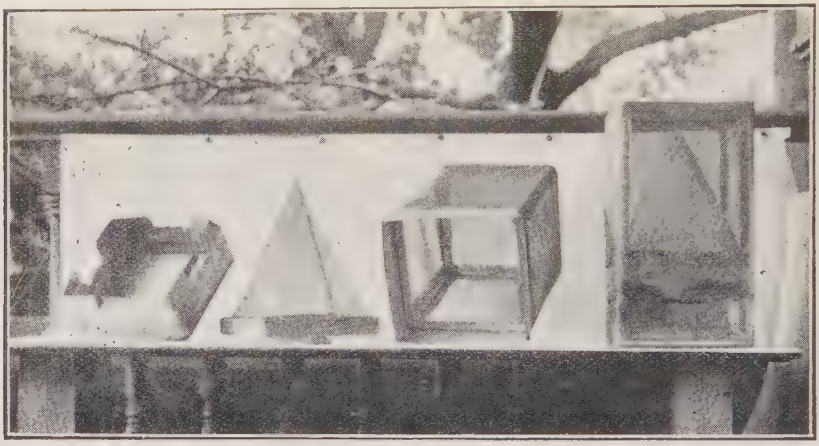
Fig. 8.



Section shewing Reservoir & Trap in position

Fig. 9.

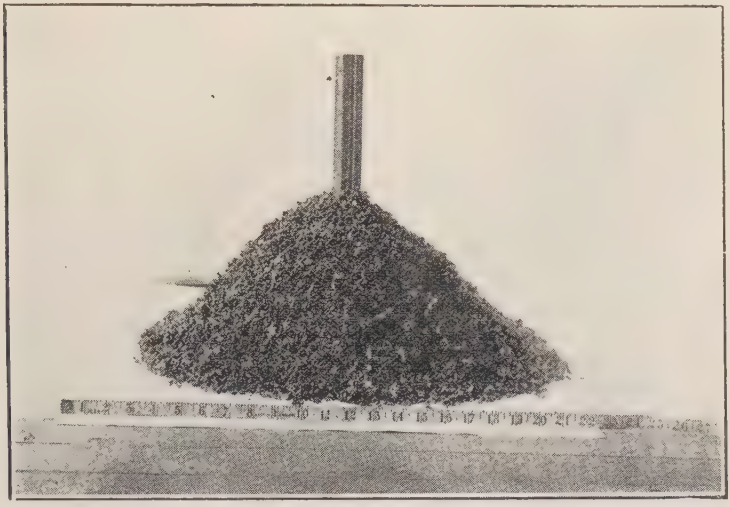
these two cuts is then bent inwards to a horizontal position, the last quarter inch being turned upwards. This gives a leading-in platform for the flies, but the last quarter inch being turned up cuts off the light, and hence prevent the flies from coming back the way they entered. Each corner of the reservoir is cut down one inch and splayed or bent in. The doing of this allows the top portion of trap to slip over reservoir one inch, leaving a quarter inch aperture for the flies to enter. It is essential to see that the corners are not turned in more than the inch advised, otherwise the top will slip over too far and block up the fly entrance.



West Australian Trap (showing sections of same).
1 Reservoir, 2 Cone, 3 Fly chamber, 4 Complete trap.

Lure or Bait.—Any offal may be used, such as putrid meat, dead rabbits, liver, heart, and lungs of animals, sour putrefying milk, etc. It is necessary to use fairly large portions of bait to obviate visiting the traps frequently. The bait must be kept moist, otherwise it soon dries up and ceases to give off an attractive odour. The animal matter is therefore covered with water and allowed to ferment. There will be in hot dry weather a constant loss of liquid by evaporation, and as it is necessary to have a moist condition in trap it will be incumbent to visit the trap every week during such weather. If the weather is cool and moist traps should only need visiting every fortnight. Keep up the liquid supply in traps and the maggots that may develop in bait from eggs deposited will be drowned. Traps should be placed wherever sheep congregate or where experience has shown that flies abound. Keep traps as close to the ground as possible and securely tied to a stake. To ensure their lasting longer they should be set on small pieces of wood, thus raising them slightly from the ground. It is a good plan to also paint the tin portions both inside and out with a good white paint, thus preventing rusting.

In the making of this trap no solder is used, the whole being done by wiring and tacking; the only tools necessary being a pair of tin snips, saw, and hammer.



This heap of blowflies numbers 200,000, which were captured between the 15th April and the 14th May, in two traps.

IRRIGATION,

(Part 1.)

A. R. CLIFTON,
Officer in Charge of Irrigation.

Before spending any capital on an irrigation undertaking a careful inspection of the property should be arranged and the whole proposition thoroughly discussed with a qualified man, otherwise money may be wasted on misdirected labour or unsuitable machinery. A contour plan of the whole area will be required and if power is to be used, the summer water level must be known. This data, which should be obtained by means of a surveyor's level, will determine the feasibility of the proposition and enable the costs of installing and operating the scheme to be estimated.

The position of the irrigated plot on the farm is mainly governed by the contour and character of the land and its accessibility to the water supply; to insure proper supervision, however, it should be adjacent to the homestead. Water must be applied to the crops immediately they require it, otherwise there will be a loss in yield. It is therefore, essential that growing crops receive constant attention. Where the irrigation plot is some distance away crops may be suffering from lack of water for some time before being discovered, owing to other work about the farm occupying the attention of the farmer, this would not occur were the plot continually under observation.

If fodder crops for dairying are to be grown, haulage will be reduced to a minimum should the irrigated area be handy to the buildings, and, if power is required the engine may be used for other farm jobs such as pumping water for domestic purposes, chaff-cutting, etc., thus reducing the annual charges of the irrigation undertaking by relieving it of a portion of the annual interest on the capital cost of the plant. Where, however, an engine is solely used for pumping water for irrigation, the whole of the interest has to be borne by the undertaking and, as the irrigation season in the South-West commences toward the end of November and finishes in early April, this must be earned in approximately four and a-half months.

Working costs must be kept down as low as possible if the undertaking is to be financially successful. This being so, it may be a sounder proposition to lay out an area which can be economically worked in preference to some other part of the farm which could be placed under irrigation at a lower primary cost.

Water Supply.

The water supply, of course, is of the utmost importance, both in regard to quantity and quality. Where the supply is limited, it is necessary to determine the flow; this can easily be done where the source of the supply is from a small soak or spring, by putting a short length of pipe through a temporary earth dam and checking the time it takes to fill a receptacle of known capacity. Larger flows must be determined over a rectangular or V-notch weir-board, the opening or notch being bevelled outwards, and

Fig. 1.—Lucerne and Maize under Irrigation.

if the former is used the opening should be two-thirds the width of the stream (see Fig. 2). The weir board should be placed with the sharp edge facing upstream, in a suitable spot in the bed of the creek where the approach of the water will be even and uniform. The weir must be level, and the bottom of the notch should be twice the head of the weir above the bed of the creek

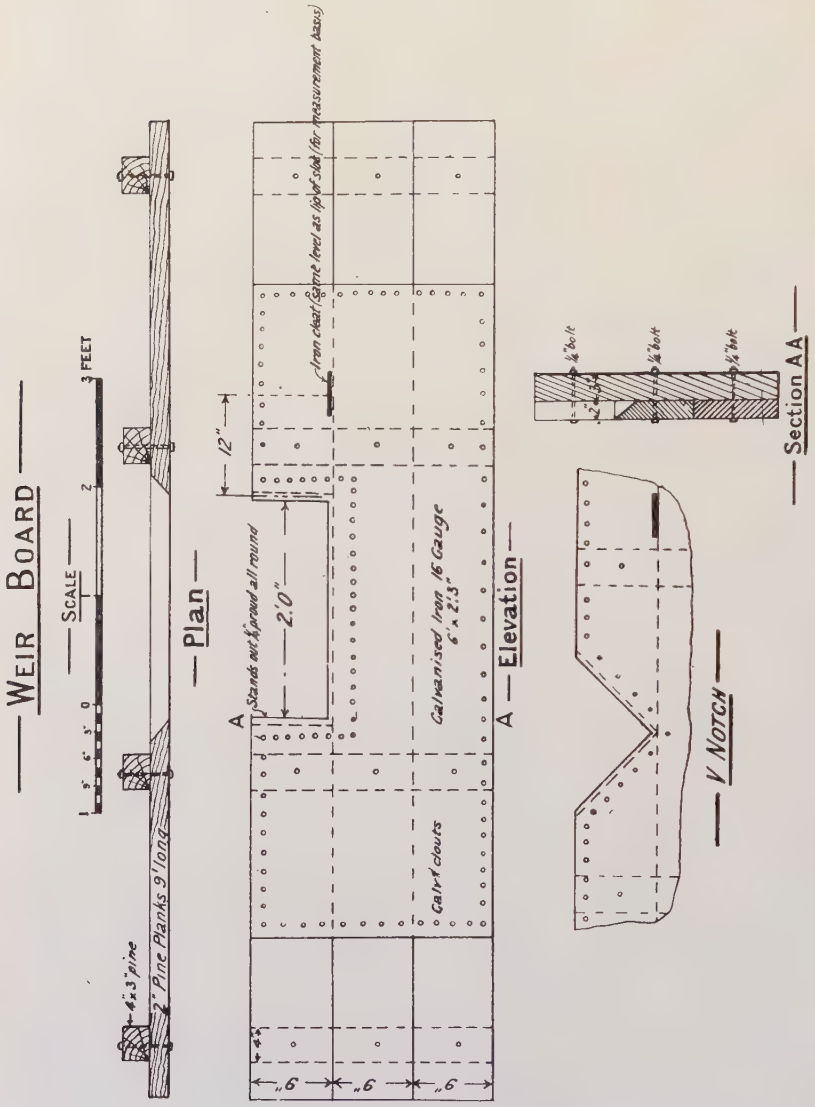


Fig. 2.—Weir Board.

or channel so that the tail water below does not interfere with the discharge. A peg driven in about three feet or more upstream, to the same level as the bottom of the notch, will enable the depth of the water flowing over it to be accurately determined.

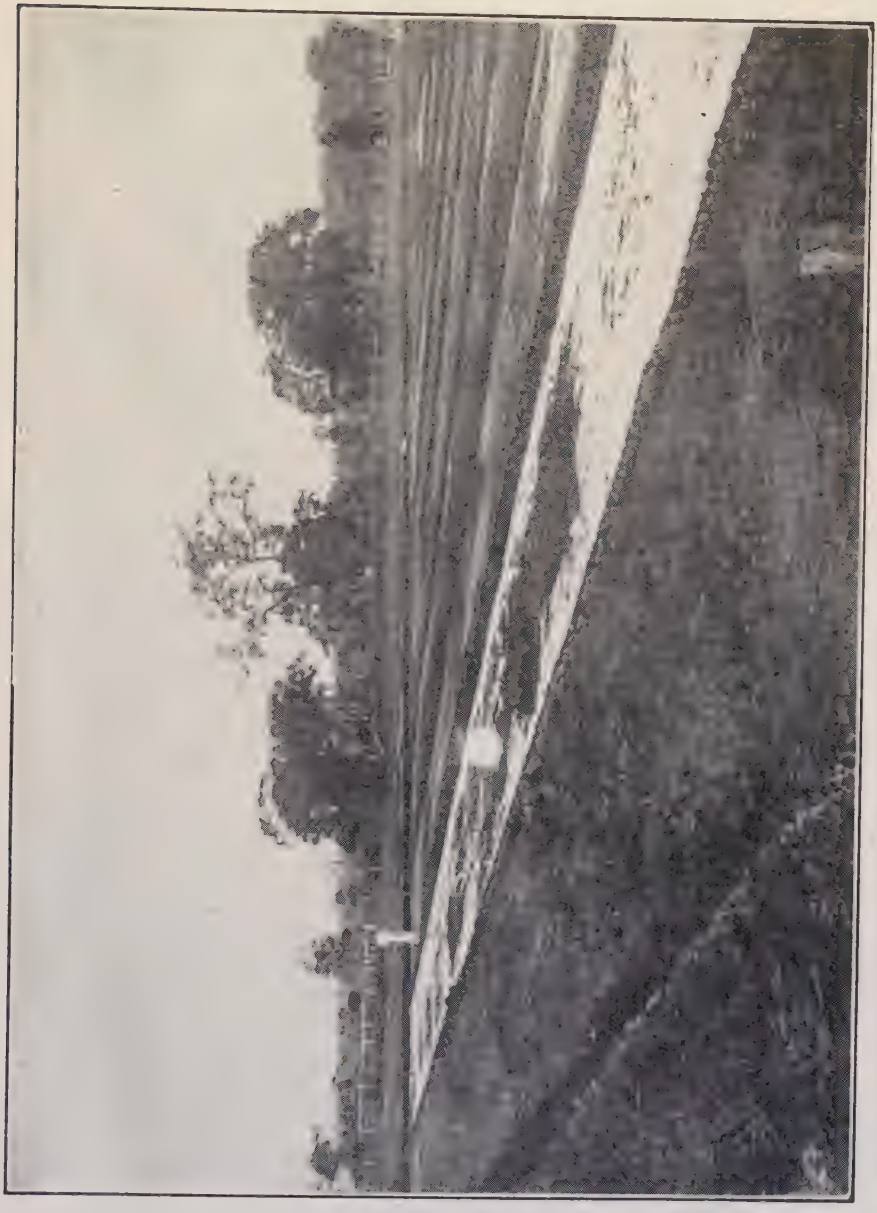
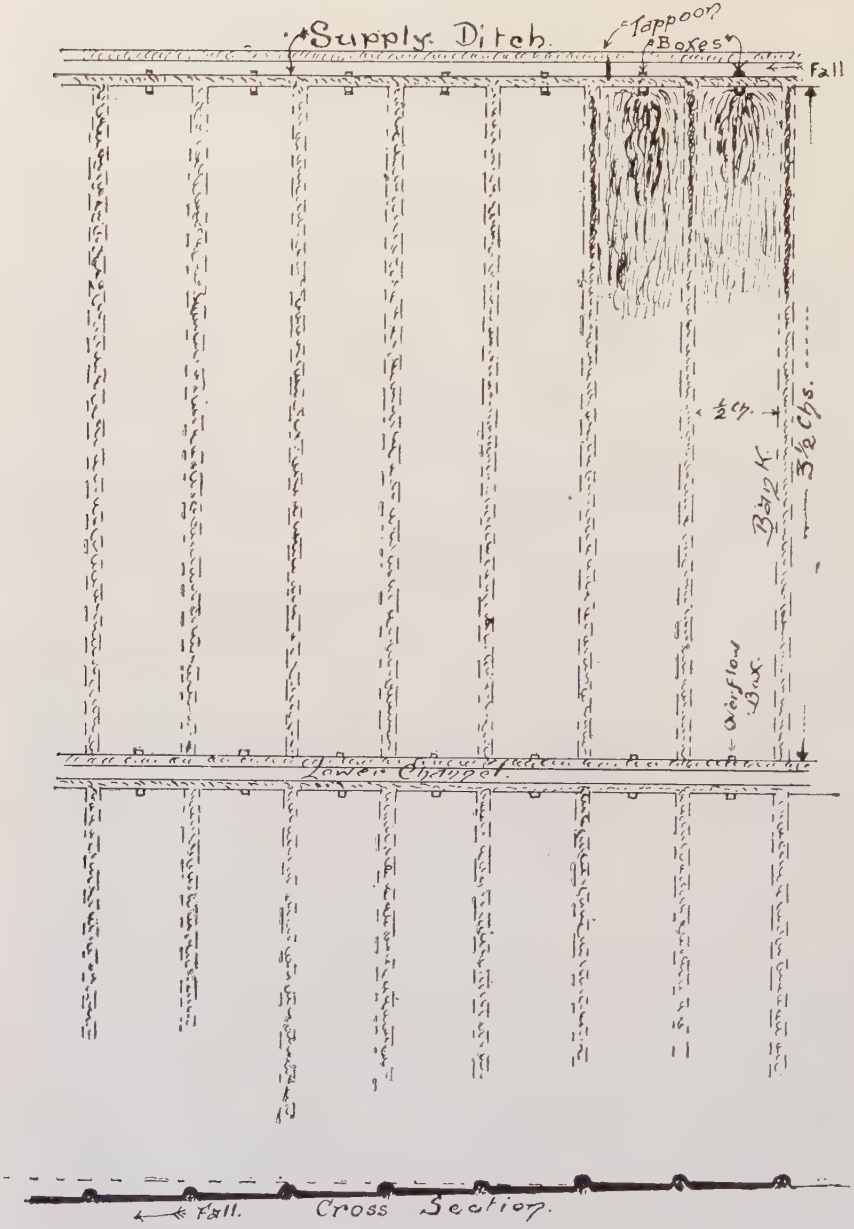


Fig. 3.—Field graded to the Border Method.

Fig. 4.



Irrigation by Border Method.

The table following gives the discharge in gallons and cubic feet per minute at various depths:—

FLOW OF WATER PER MINUTE OVER WEIRS.

Depth in inches.	V. Notch.		Retangular Notch.	
	Flow in Cubic Feet.	Flow in gallons.	Flow in cubic feet per inch in width.	Flow in gallons per inch in width.
2	1·755	10·94	1·133	7·06
2½	3·045	18·97	1·582	9·86
3	4·782	29·79	2·082	12·96
3½	7·002	43·63	2·621	16·33
4	9·75	60·74	3·203	19·96
4½	13·05	81·29	3·823	23·82
5	16·95	105·6	4·476	27·89
5½	21·46	133·7	5·165	32·18
6	26·63	166·0	5·886	36·67
6½	32·49	202·4	6·637	41·37
7	39·05	243·0	7·418	46·22
7½	46·34	288·7	8·277	51·26
8	54·06	337·0	9·061	56·45
8½	62·92	392·0	9·926	61·84
9	72·90	454·2	10·813	67·37
9½	83·33	519·2	11·727	73·06
10	94·70	590·0	12·664	78·90
10½	106·87	665·8	13·627	84·90
11	119·96	747·4	14·61	91·02
11½	133·91	834·2	15·601	97·20
12	148·89	927·6	16·648	103·72

The amount of water required per acre and frequency of waterings depends on the conditions, and will vary considerably.

For orchards provision should be made for one acre foot or 271,488 gallons per acre; in many cases it will not be necessary to apply this amount, but in installing a scheme it is advisable to have the quantity available if possible. Two waterings, from 4in. to 6in., have been found ample for the season in most of the irrigated orchards in this State.

Lucerne requires a large quantity of water, and where it has been grown successfully under irrigation in the South-West up to 2½ acre feet are used during the irrigation season, applied at the rate of 4in. to 6in. per watering per month.

Crops such as maize, sorghum, millet, vegetables, root crops, etc., will require lighter waterings and at more frequent intervals.

The weather conditions and type of soil also affect the frequency of waterings; for instance, deep soils will take more water per irrigation than shallow soils, and therefore the intervals between waterings will be longer in the case of the former than in the latter.

An approximate estimate of the minimum quantity of water required per acre is to reckon on using one acre inch (22,624 gallons) every seven to 10 days.

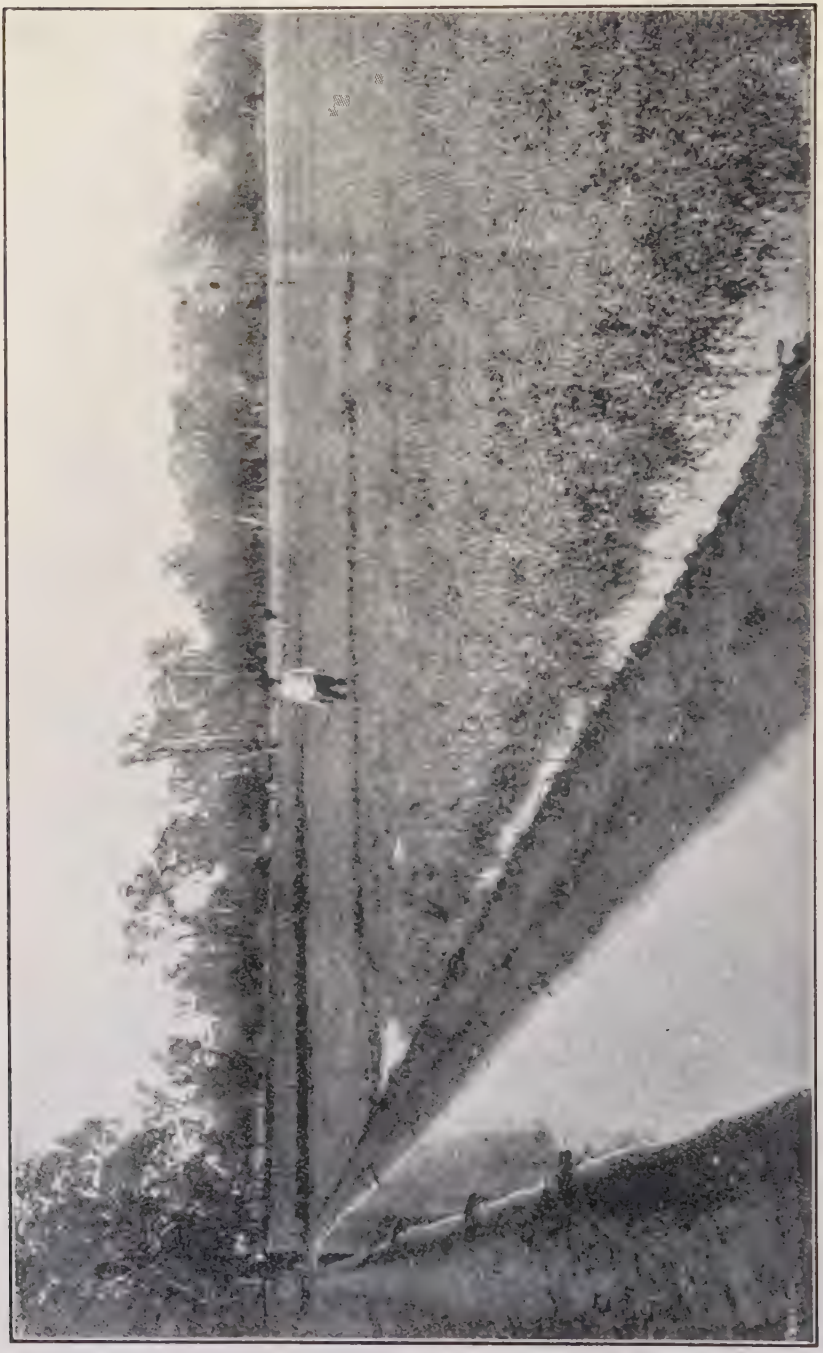


Fig. 5.—Flooding Lucerne by means of Level Checks.

Quality of Water Supply.

Where there is any doubt with regard to the quality of the water it should be analysed. This work is undertaken at a special rate of 5s. per sample for bona fide settlers and each sample (not less than a liner bottle full) accompanied by the fee, should be forwarded to the Government Analyst, Wellington Street, Perth.

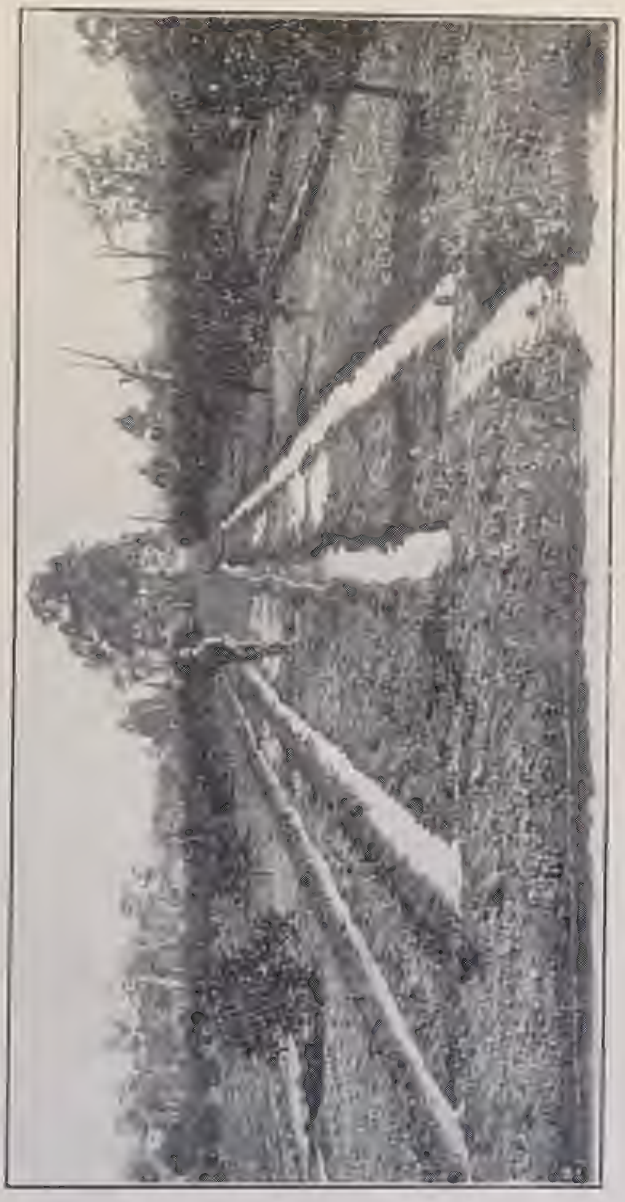


Fig. 6.—Irrigating Orange Trees.

Fig. 7. Young Maize, showing system of Planting and Irrigation.

The amount of deleterious saline content of water which can be safely used, varies with the conditions, and no hard and fast rule can be laid down as the soil conditions and the nature of the alkali present in the water must be considered in conjunction with the rainfall. Those soils permeable to water and having a good drainage will stand a higher percentage of salt in the irrigation water than heavy soils.

Water charged with dangerous amounts of alkali must not be used on strong soils, and on other soils should only be applied by means of furrows, as it does not then come in direct contact with the growing plant. The drainage must be such that the percolating of the winter rains through the soil will leach downwards and carry off in the winter drainage any excess of alkali accumulated in the top layers of the soil during the summer. On the other hand good irrigation water used injudiciously on soils with bad drainagt will ultimately have disastrous results. One hundred grains per gallon is excessive, and though under favourable conditions and by exercising judgment and care water containing this amount has been used successfully, under other conditions water containing half this amount of those forms of saline matter known to be deleterious to plant life may be unsafe for continual irrigation.

Methods of applying Water.

There are three distinct methods of applying water to the land practised in this State, viz., flooding, furrows, and sprinklers.

Flooding.—There are two different systems of applying water by this method, one covers the whole surface of the land with a thin sheet of running water, and the other covers the surface of the land with a sheet of standing water. In the former method the field is divided into long narrow strips by low ridges laid out at right angles from the ditch in the direction of the fall. These ridges serve to confine the water within each strip as it slowly traverses the field from top to bottom (Fig. 3). It is important to form the land between the ridges as nearly level as possible, and enough water should be let out of the ditch to cover the full width of the plot. This is kept running until three-fourths of the way down the slope, when it is turned off. The water will reach the end, and if care is exercised no waste will occur. This system is known as the "Border method" (see Fig. 4). Where the conditions are suitable for this system, and the land is properly prepared it is strongly recommended for lucerne growing, as the water is evenly applied to the land and it is economical in both labour and time.

In the second system the water is impounded on a level plot by low check banks. As soon as the required amount of water has been applied it is shut off, and that covering the land left to soak in. (Fig. 5.) When the supply is cheap and abundant the water may be spread over the land by drawing it from check to check, but where the supply is limited, a great saving will be accomplished if the land is plentifully supplied with small ditches from which the water can be delivered direct on to the plots, thus preventing the continuous flow of water from one tier of checks to another, which is wasteful owing to the fact that the first tier of checks into which the water is delivered will receive a greater amount of water than is actually required, whilst the last checks will possibly receive an insufficient quantity. This system of flooding by "level checks" has given excellent results for

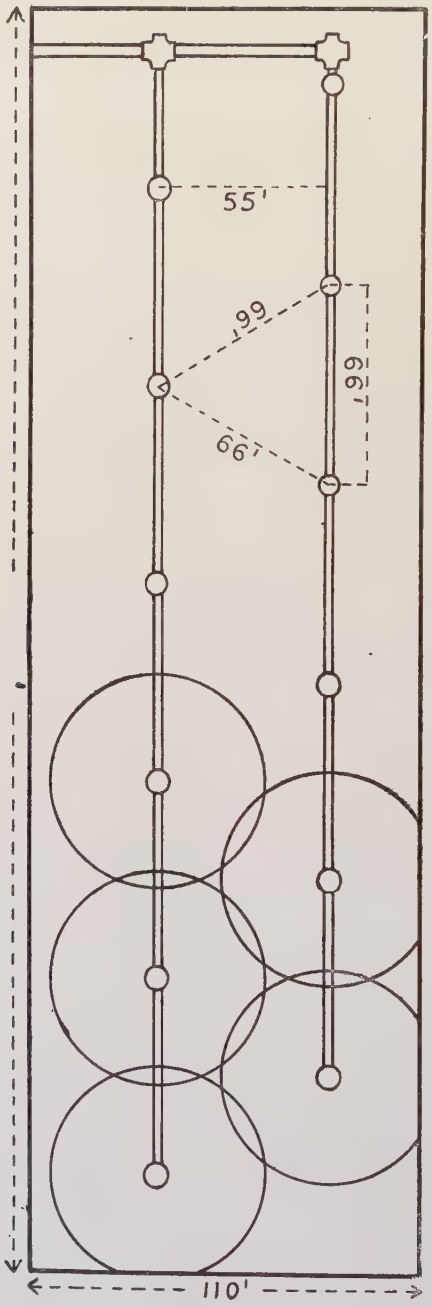


Fig. 8.—Spray System.

lucerne growing, but it is rarely that the farmer has land level enough to be able to lay out this system without going to considerable expense in grading, and one of the main objects is to reduce the grading to a minimum, for apart from the expense it is advisable to remove as little of the surface soil as possible. Where heavy grading is undertaken it takes some time for the land to recover.

Fig. 9.—Movable Spray System of Irrigation. Nunan's patent.

Irrigation by flooding is suited for crops like lucerne, small grains, grasses, etc., which occupy all the land and where no cultivation between rows is possible. It is also used for wetting dry land preparatory to sowing. This system requires a larger head of water than any other, and can only be used where the land is fairly flat. It is not advisable on heavy soils, as the water percolates very slowly and they are also liable to puddle.

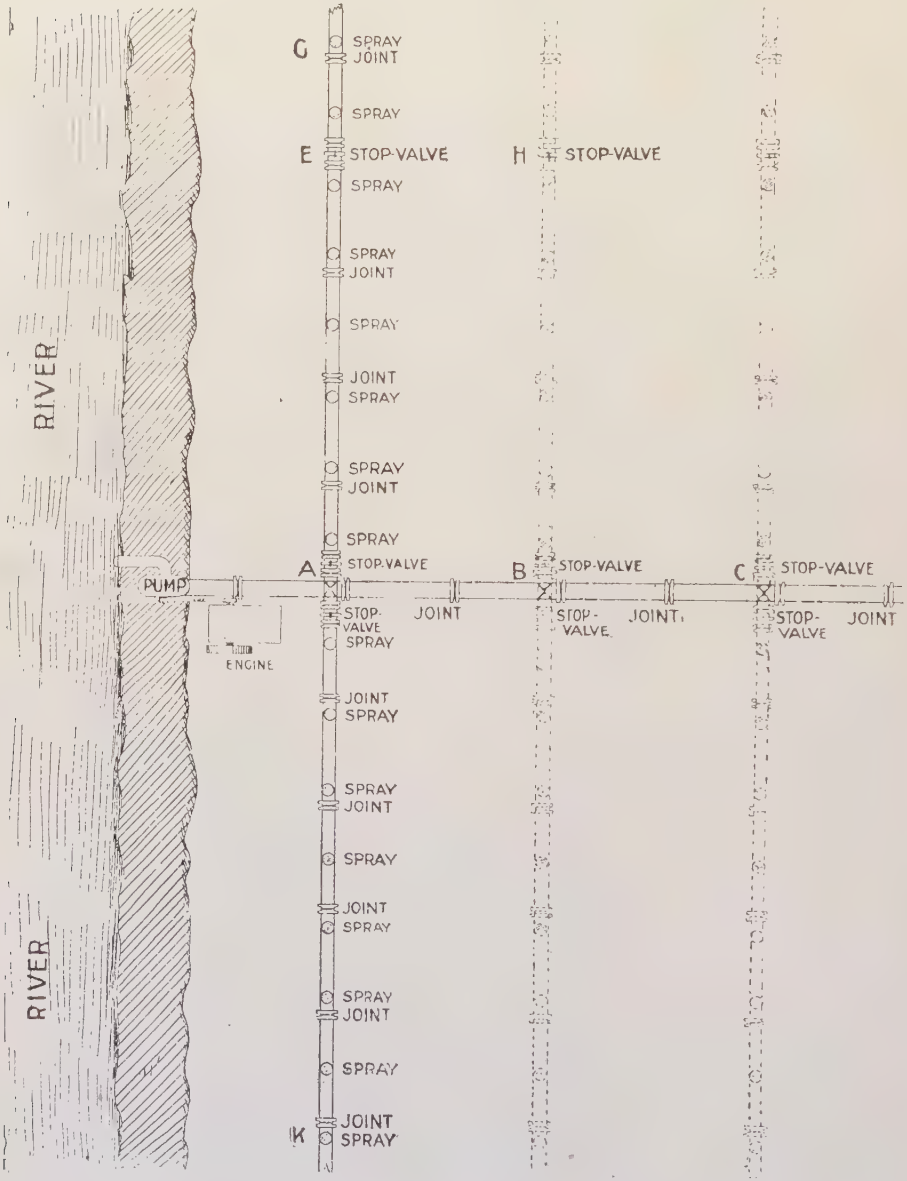


Fig. 10.—Spray or "Over-head" Irrigation—Nunan Movable System. This plan simply shows how the system is applied; method of laying it out will depend on the contour of the ground.

Furrow System.—This is the best for orchards (Fig. 6) and fodder crops planted in rows and cultivated during the growing period (Fig. 7), such as maize, sorghum, millet, etc., and is used also for root crops and vegetables. The water is applied to the land by means of furrows formed for the purpose between the rows or drills of the crop after planting. This system

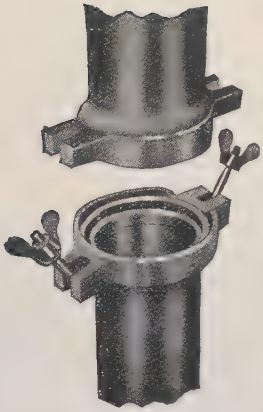


Fig. 11.—Movable Pipe System. Joint (Light Pipe).

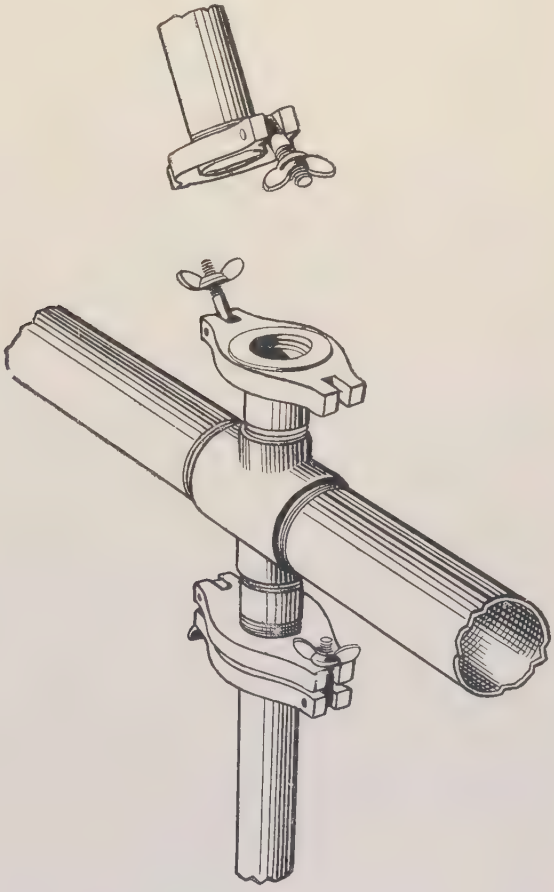


Fig. 12.—Movable Pipe System. Quick Coupling Flanged Joint (Heavy Pipe).

is the one most commonly adopted in this State, and has the following advantages and disadvantages:—

Advantages—

1. The cost of preparing the land is less than for other systems.
2. The loss of water due to evaporation and seepage is small.
3. Small heads of water can be conveniently and advantageously used.
4. Alkali is less liable to rise than with the other methods.
5. There is little displacement of the top soil.
6. The soil is moistened chiefly beneath the surface by capillarity.
7. The surface soil, after being watered, is not caked nor hard to cultivate.

Disadvantages—

1. Large volumes of water cannot be rapidly applied to a field.
2. The upper and lower ends of a furrow seldom receive equal amounts of water.
3. It is difficult to distribute the water evenly on porous soils.

Sprinklers.—The principal advantage of spray irrigation is economy in the use of water, as there are no losses by seepage. The system enables irrigation to be practised when the water supply is limited, and when the ground is uneven and too costly to grade. A small pumping plant forces the water under pressure through the pipes, and the land can be subjected to a

Fig. 13.—Spray Irrigation—Skinner System.

shower of artificial rain at will. Thus a spray system of irrigation resembles somewhat the water system of towns and cities, and can be used in the homestead and barns for such purposes as supplying all the water for domestic use.

It is not economy to use small pipes, because of the loss by friction. Windmill power and overhead tanks can be used for irrigating small areas, and a head of not less than 20 or 25 feet should be arranged so as to allow for necessary pressure. Again, there are many cases in which the method of flooding or furrow irrigation are unsuitable. Where the surface of the ground is hilly, irregular, or where the land is too valuable to be occupied by furrows or water channels, these and other conditions will be favourable to a system of spraying.

Fig. 14.—Spray or "Over-head" Irrigation, Stewart & Lloyd's System, with O'Grady Patent Sprinklers.

In some cases the pipes are laid about a foot beneath the surface so that they can never be disturbed by the plough. The size and distance apart of pipes must be controlled by the head or pressure of the water supply. (Fig. 8.)

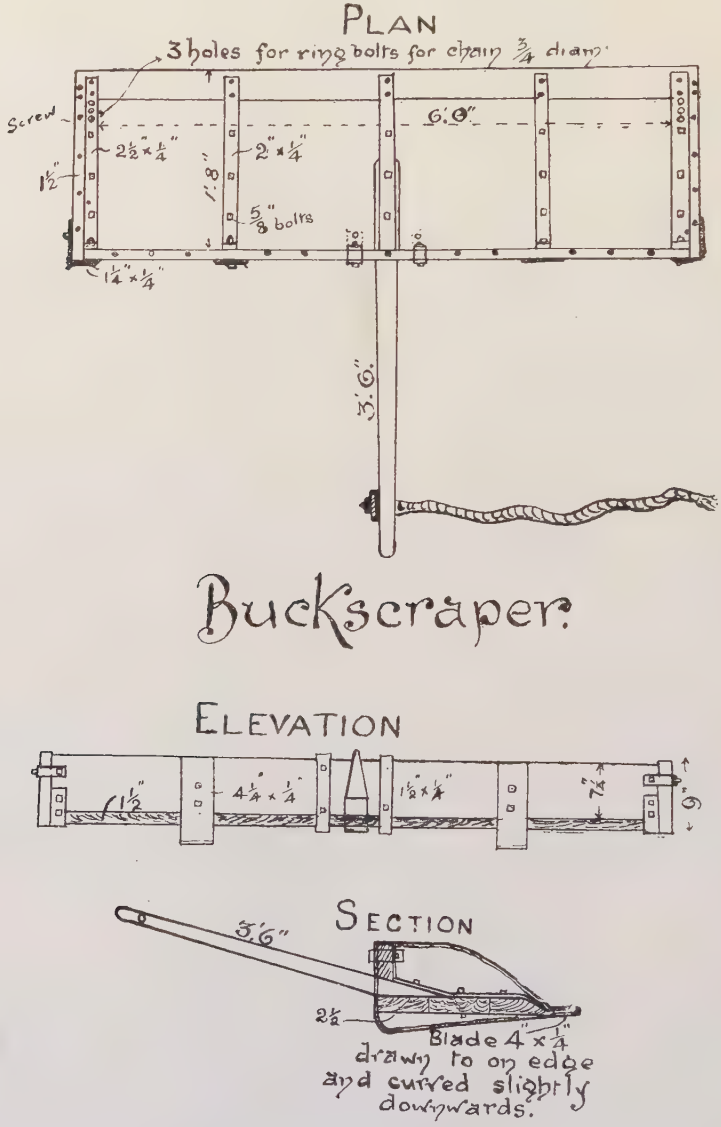


Fig. 15.—Diagram of Buckscraper.

The movable pipe system (Figs. 9, 10, 11 and 12) is also extensively used, and has the advantage of being less costly in the initial outlay, but it entails more labour in operating. The use of sprinklers has been found very satisfactory in hilly grounds—the water can be regulated and evenly

distributed in such a manner that none is wasted or the soil displaced. The soil is not so liable to cake or form a crust, thus diminishing a very serious difficulty which exists in most other methods of watering.

In vegetable growing it has been found effective in keeping under control insect pests, and the foliage retains a healthy colour. (Fig. 13.) Evapor-

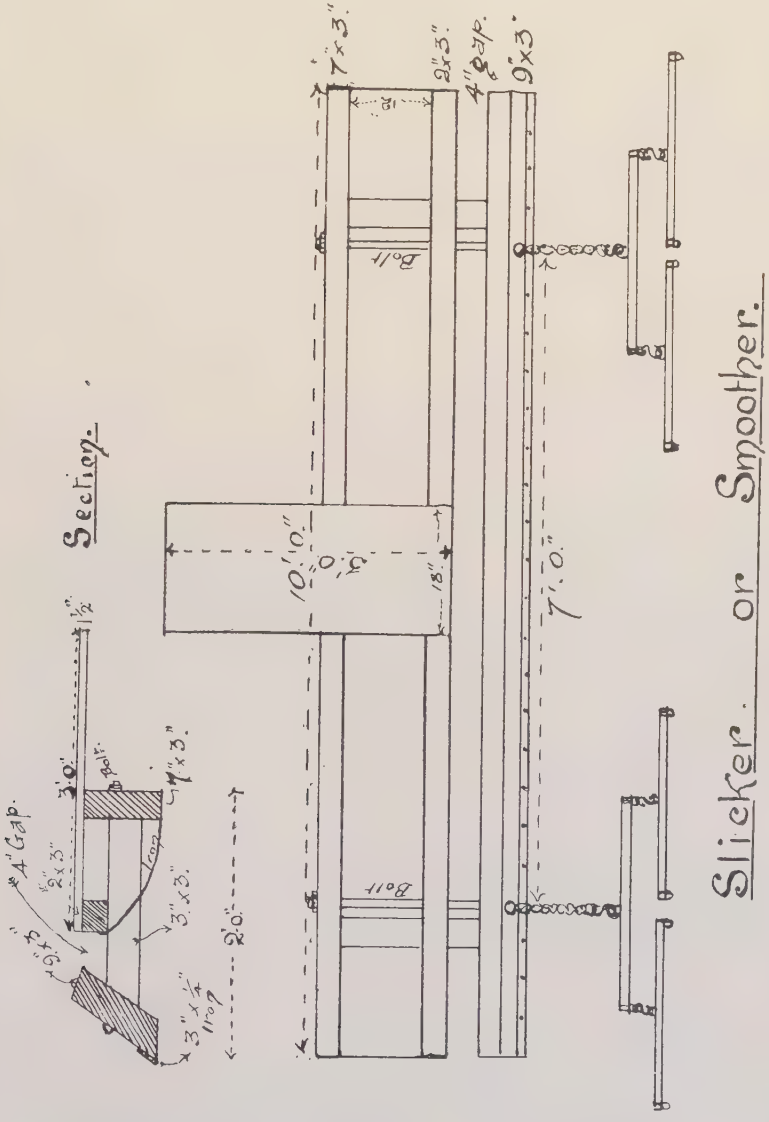


Fig. 16.—Diagram of Slicker or Smoother.

ation is naturally high, but this can be avoided to a great extent by watering in the early morning and late in the evening. (Fig. 14.) The system is costly, but splendid results are obtained, especially by market gardeners and small fruit growers.

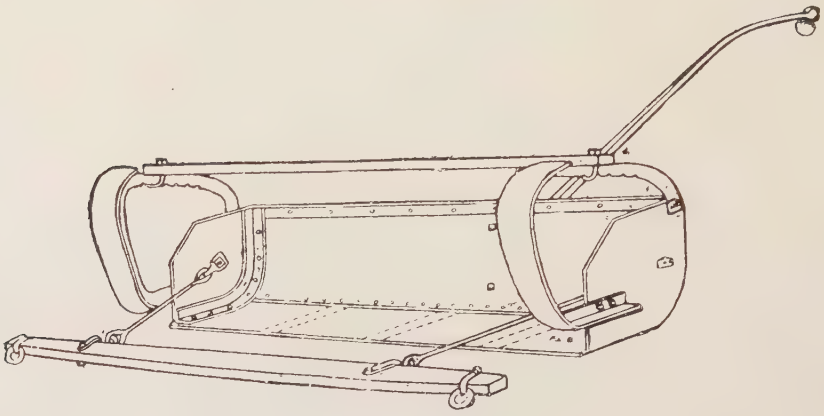


Fig. 17.—Fresno Scoop.

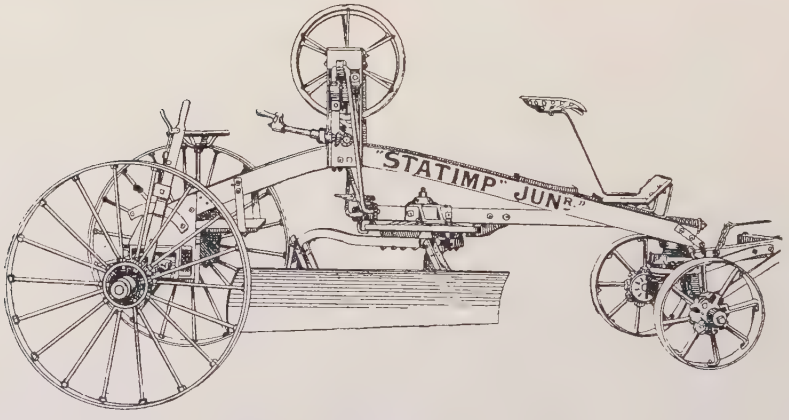


Fig. 18.—Four-wheeled Grader.

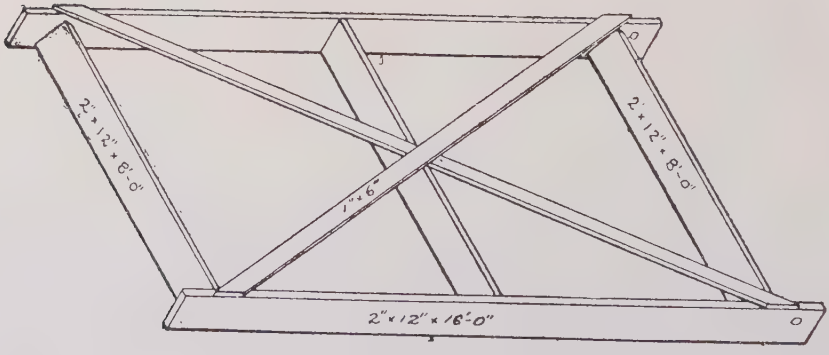


Fig. 19.—Home-made Drag or Leveller.

The "Basin method" and "metal pipes and canvas hose" are other systems that are sometimes used.

The former is chiefly confined to orchard irrigation; a basin being made round each tree which is filled from a furrow run down every row. It is applicable to orchards containing soils of widely different texture, and time required in applying water is much reduced. It necessitates considerable shifting of soil for each irrigation, and heavy soils are apt to cake after being flooded. The system is useful for young trees, or where only a limited supply of water is available. When practised continually it tends to form a hard-pan beneath the cultivated layer, and may bring the roots of trees near the surface—there is also the danger of trees being scalded by the water in summer.

Metal pipes and canvas hose.—This system is used where the land is too porous or too expensive to grade for furrow irrigation. The following is a summary of the advantages and disadvantages:—

Advantages—

1. Losses which would otherwise occur by seepage in the conveyance of water over a field are prevented. Further loss in application due to crab-holes is also largely eliminated.

Fig. 20.—Buckscraper at work.

2. A small stream may be handled effectively over a large area, and the water can be applied to any part of the field.
3. No land is occupied by laterals, and the time required to construct and repair these is saved.
4. There being no laterals the land is free from obstruction; crops can therefore be harvested with greater ease and with less wear and tear on farming machinery.
5. Land can be irrigated with little or no preparation, although it is better to level the land to some extent if it needs it.

Fig. 21.—Teams at work constructing a main channel with Buckscrapers.

Disadvantages—

1. Initial cost is high, especially where underground pipes form part of the system.
2. Pipes and hose require careful handling to prevent their being damaged. Canvas hose, even with best care, is short lived and requires frequent renewal.
3. It is necessary to have pressure head on pipe in order that a fair-sized stream may be carried.

Grading Implements.

Different types of implements used for levelling and preparing the land for irrigation (generally termed grading the land) are shown in Figs. 15, 16, 17, 18 and 19.

The most common are the buckscraper and the slicker or smoother.

The former is a most effective implement for moving loose or sandy earth where the haul is short, and in every case four good horses abreast are necessary. (See Fig. 20.) It is strong, portable, and has a wide range of use. (Fig. 21.) Further, it loads quickly and loses little in transportation.

Fig. 22.—Slicker at work.

After the load is spread the team may be turned readily, and when empty the scraper is drawn with sagging traces. It has, however, the following disadvantages:—

1. The work is heavy, and labourers object to the constant lifting in loading and spilling.
2. Skill in handling is necessary for rapid work, and experienced labour is usually difficult to find.
3. Roots and rubbish will catch on the blades, making it impossible to load until removed.
4. A good steady team is required.

The smoother is used for finishing off after the rough work has been done with the scraper. This also requires four good horses, and is operated by the driver standing forward or back according to whether it is desired to

pick up a load or let it go. (Fig. 22.) When the weight of the driver is forward the cutting blade bites into the soil, the implement pushing it in front until desired to unload, which is done simply by the operator stepping back on to a tail-board so constructed that the weight of the driver will cause the front of the implement to lift off the ground. It will be noted that two two-horse sets of swings are attached separately to these implements, and

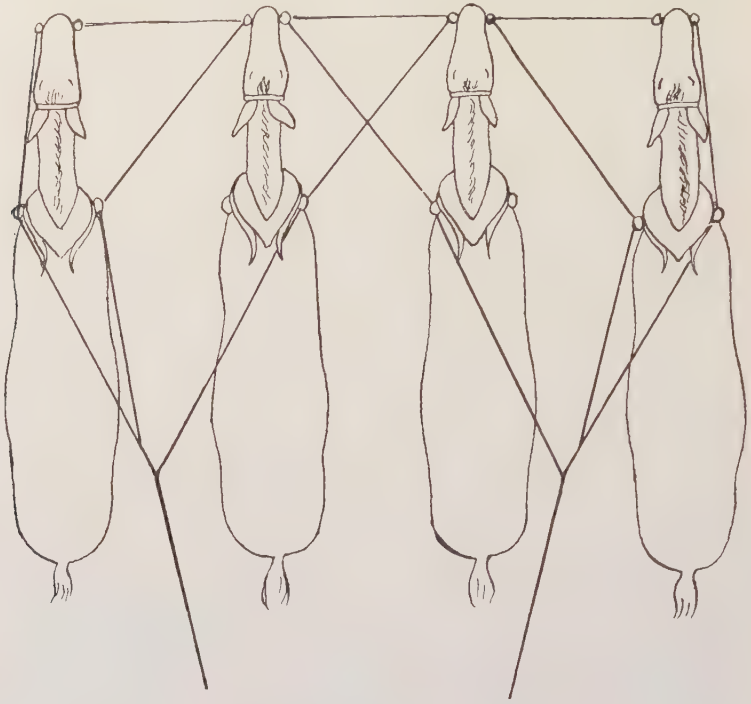


Fig. 23.—System of Reins for Four Horse Team.

no four-hourse swing is required. It is necessary to hitch the team on in this manner so as to prevent the implements swinging sideways should the draught when loading not be evenly distributed on the whole length of the cutting blade. It is important that these implements work square on, otherwise the spoil is lost round which ever corner is dropping back. Double reins with an extra check rein are recommended, so that the team can be kept even. (Fig. 23.) This type of rein will also prevent the horses treading on one another when turning.

(*To be continued.*)

POULTRY NOTES.

W. T. Richardson,
Poultry Adviser.

FEEDING MUSCOVY DUCKLINGS.

Frequent inquiries come to hand regarding the cause of losses in ducklings. Some cases reported have been investigated by inspecting the stock and premises, and in nearly every instance the cause of the trouble has been definitely diagnosed as "bad management."

It is not reasonable to expect birds of any description, particularly so young birds, to thrive and develop profitably when improperly fed and kept under insanitary conditions, yet, such conditions are only too prevalent amongst small breeders.

Care in the selection of the breeding pen should be the starting point. Healthy, vigorous ducks of good size, and not less than second season birds should be bred from. The drake may be a first season active, vigorous bird, and should be unrelated.

Feed your stock birds, morning and evening, on mash only, consisting of (bulk measurements) 50 per cent. finely chopped green stuff, the balance to be composed of equal parts of bran and pollard. Should the pollard be coarse, alter the foregoing to 2½ parts pollard and 1½ parts bran. Mix with water or skim milk in which oilcake, at the rate of 3 lbs. to every 100 lbs. of mash, has been soaked overnight. Make their feed wet but not sloppy, and give in the morning as much as they will eat in 20 minutes, any left over to be removed. In the evening be more liberal with the ration, as ducks are night feeders. The drinking vessels should be not less than six inches deep, and clean water given three times every day. Keep the latter sheltered from the sun.

Forcing breeding ducks for egg production, by the use of condiments, meat meals, etc., will result in low fertility and weakly ducklings.

The first batch of eggs for the season laid by muscovies generally contains a large percentage of infertiles, therefore they should not be set.

Ducklings should not be fed for the first 48 hours. During the next fortnight the following mash should be given five times daily, *i.e.*, one part of scalded bran to which add, when sufficiently cool, two parts pollard, the lot mixed with water, or skim milk by preference, to a crumbly state. For the next two weeks continue feeding five times per day, and add one-third part of finely-chopped succulent green feed—lettuce if available. One meal per day to contain five per cent. bonemeal. For the next four weeks feed as above four times daily, and from thence to marketing time three times per day.

At six weeks old add four per cent. meatmeal one feed daily to their mash.

In the early stages feed little and often, and never do so in their sleeping quarters.

Do not allow your ducklings to get wet, therefore see that their water tins are not deep enough for them to get in and have a swim. This can be prevented by placing a stone, brick, or other object in the vessels. As the birds grow, so must the depth of the vessels be increased to enable them to put their heads under water and thus keep themselves clean.

Clean out the vessels and give fresh water every time the ducklings are fed.

Do not overcrowd in their sleeping quarters or in the yard and keep both absolutely clean, especially the former, which should have dry sand or clean dry straw supplied every day. In warm weather provide shelter from the sun.

EXPERIMENT IN EGG PRESERVATION.

An experiment, extending over a period of 20 weeks, was recently concluded, its object being to test the suitability of a local product, known under the trade name of "Regan," for the preservation of eggs in shell and the possibility of this product taking the place of cold storage.

"Regan" resembles kapock in texture and usefulness, and is credited with being air-tight when closely packed as well as a non-conductor of heat. The latter has been demonstrated in other directions.

For the purpose of this experiment new laid eggs and cases, supplied free of charge by Messrs. Nelson & Co., were used.

On January 13th four export cases—15 dozen to the case—each containing two dozen eggs packed in "Regan" were stored in the office of the Council of Industrial Development. The mode of packing was as follows:—one layer of 12 eggs was placed over a pad of "Regan," about 1½in. in thickness after being pressed down evenly, followed by a pad of equal thickness; next a further layer of 12 eggs, and finally more packing. Care was exercised in having about 1½in. of packing between the eggs and the sides of the cases, also some between the eggs to avoid contact with one another. Finally the cases were closed down, nailed and stored.

On June 3rd the cases in question were opened, and the eggs examined. Their contents showed considerable reduction due to excessive evaporation, the whites lacked substance and were extremely watery, and the yolks adhered to the shell and spread when the shell was broken. The eggs had no unpleasant odour.

This test being for the purpose of determining the suitability of "Regan" in replacing the cold storage process of egg preservation for table purposes, it failed to attain the desired object.

At times any man will slip. I do not expect perfection, but I do expect genuine and sincere effort toward being decent and cleanly in thought, in word and in deed.—"Roosevelt."

CONCERNING FOXES.

C. J. Craig,
Chief Inspector of Rabbits.

The European fox has spread over a large part of Australia—having, broadly speaking, followed the rabbit, but, not being quite so adaptable, it has not penetrated into the highly arid places, in which the rabbit is able to maintain itself in security if not in comfort. The fox undoubtedly exercises a certain restraint upon the rabbit (and in the aggregate a very large number of that pest is so destroyed), but it may be looked upon as one of the worst kinds of noxious animal. Not only does it destroy great numbers of birds—especially ground birds—but in every State it accounts annually for many lambs and even full-grown sheep. During the three years ending with 1915, some 207,000 sheep (including lambs) were recorded as having been destroyed by foxes in New South Wales alone. In cattle-raising parts but little attention is paid to their existence.

The extent to which the destruction wrought by the fox has retarded poultry-keeping is very great. At the time when he first made his appearance on the upland plains of Monaro (Maneroo) in New South Wales, turkey-raising was being conducted on a large scale and very economically —the birds simply roving the open country. But the fox quickly altered the situation. Everywhere in the poultry-raising industry the precautions continually taken against him have added greatly to the cost of production.

The earliest Australian record of foxes comes from Victoria. Between 1870 and 1880 (according to the *Ballarat Star*) Dr. King imported a pair for breeding. There were many other introductions at various times. In Western Australia, where they are not numerous, the first fox was recorded in 1915. Tasmania alone of the States has entirely prohibited its introduction.

No complete record of the destruction of foxes is available for the whole of Australia, and though 48,077 are recorded as having been destroyed in New South Wales during the five years 1920-24, this is undoubtedly but a minor portion of the total killed in that one State.

In many districts a price is set upon the fox's scalp, ranging in various places from as low as 2s. 6d. up to £1.

The fox shows a variation in fur and physique similar to that which is displayed by the rabbit. In the uplands the animal is larger and has a much heavier coat than those of the drier and warmer lowlands.

When the fox is surrounded by plenty of protective cover, and with water-fowl and rabbits in abundance close at hand, the conditions are most congenial. His favourite haunts are therefore amidst the woodlands adjacent to rivers, lakes and swamps, morasses and lagoons, or in boulder-strewn country. Within his lair—a hollow log, a standing tree trunk, a fissure or crevice between the rocks—he finds a safe retreat wherein, immune from molestation and distractions, he sleeps, and ponders upon his past transgressions and escapes, and plans his next nocturnal raiding expedition to some neighbouring sheep or poultry farm.

He is fastidious in his diet if his propensity to raid the local fowl roosts be an indication of his tastes; or, may be, his love of a plundering life full of hazard and exciting incident explains his weakness for the domesticated fowl. His method of bringing his intended victim down from a high roost is very ingenious. He runs around and around the tree or other roost from which the fowl in terror watches him until it becomes hypnotised or giddy, and falls into the clutches of its wily foe. He is fond of fish, water-fowl, and other bird life that nest and feed upon the banks and foreshores of lakes and rivers, and when the young ducks are about Reynard gets a great harvest. Prowling stealthily about with all his keen senses alert he steals upon his victim unawares. Along the margins of some of the inland lakes and rivers the pad of the fox is sometimes well defined and easily seen. His principal food is rabbits. In the breeding season, the many thousands of foxes that roam about the country destroy immense numbers of young rabbits in their nests within the little breeding burrows. Through his keen senses the fox locates within the burrow the position of the litter, and from directly above scratches a hole in the ground until he reaches them. The little kittens, often thus destroyed before they are furred, are much appreciated by the fox which, in the breeding season, is always on the lookout for the little breeding burrows. When he catches a full-grown rabbit he frequently takes the liver only, leaving the rest of the carcase.

In hunting his prey and eluding his enemy the fox is necessarily cautious and cunning in his movements, and he has acquired a reputation for slyness that is a proverbial by-word; yet he is not difficult to poison. He is not so distrustful as to anticipate the intentions of those who endeavour to bring about his destruction with a dose of poison, provided that care is taken to conceal his intention. Birds, especially parrots, which possess a strong odour, the liver of rabbits, the pluck of a sheep, or a piece of bacon attract him; in fact, any part of the flesh of an animal is a suitable medium with which to mix the poison, but parrots and liver of rabbits are perhaps the most attractive. If birds be used for bait, the poison should be placed within the mouth of the bird, as the fox prefers the head, and devours it readily. Household dripping is also a good medium. Boil the dripping and add half an ounce of strychnine to about six pounds of dripping, or the same proportions if more or less dripping is used. Put a dessert-spoonful of fat when cool, but before it hardens, on a piece of paper, wrap it up loosely and place it on the trail beneath some leaves or grass.

When applying the poison to pieces of liver, pluck, bacon, etc., make an incision in the bait, which should be about a cubic inch in size, with a sharp knife, insert the strychnine (about as much as will lie on the end of a blade of a pen-knife) well into the cavity and close it up, taking care not to touch the bait with the hand. Whether the fox is likely or not to detect the contact with the human hand, it is perhaps as well to take this precaution so that there will be no possibility of the fox being made suspicious of the bait by the smell of human contact.

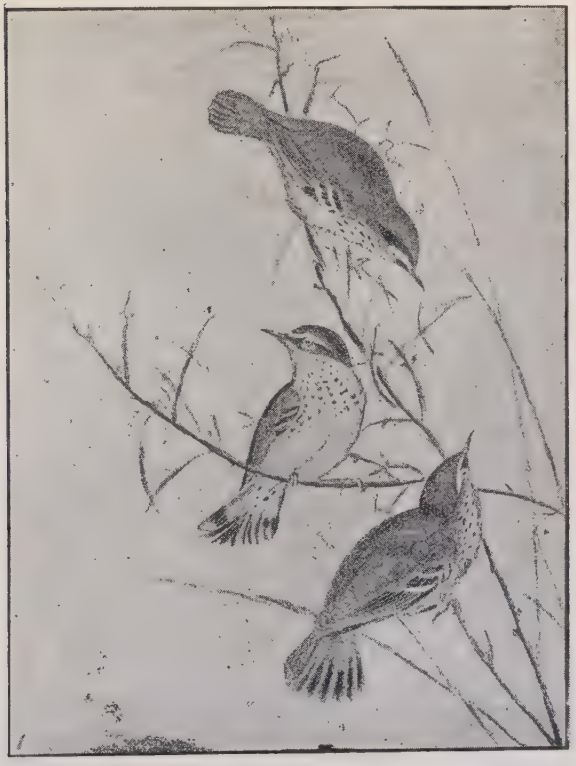
Strychnine is the best poison because, being quick in its action, especially if mixed with fat, which quickly melts in the stomach, the fox is usually found near the trail. Prepare the baits and then, in order to make a scent trail, get a bird, a pluck, or a piece of meat and singe it well over a fire. Drag it along and drop the baits nearly but not right on the trail. The baits

are more attractive if partly covered with earth, leaves or twigs, with a portion of the bait protruding. In this manner the fox itself conceals his surplus supply of food, and his appetite is probably sharpened by the satisfying belief that he is purloining the hidden goods of one of his provident and thrifty relations.

The baits should be laid at intervals of about 100 yards. After getting the first bait the fox follows the track along seeking another one, and often succumbs by the time he has reached the second or third bait.

The vixen has one litter a year, and the average number of young is about five or six, although litters of ten are common, and even more are occasionally found.

If she knows that the burrow or other place of concealment in which she has her litter is detected, she will, like the dingo, probably move them to another place.



NARROW-LEAVED CLOVER.

(*Trifolium angustifolium*, L.)

Narrow-leaved clover is one of our less important introduced annual clovers. Never sown, it occurs sporadically in waste lands on the coastal plain, and in paddocks of the Great Southern districts. Of straggling habit it produces very little herbage, which is not very succulent, the stems being coarse and wiry. At the same time it has some value, as it grows outside the zone in which most of the better known clovers occur, withstanding the drier conditions better than the species of more economic importance. On account of its very narrow leaflets and unusual habit it is not readily recognised as a clover, especially when not in flower.

Description of Plant.—An annual of a stiff erect habit with wiry stems, the whole plant covered with white hairs which lie against the surface of the plant. Leaflets linear, one and a-quarter to over two inches long, stipules long with long, slender points, hairy and green, or red-nerved; flowers in terminal stalked dense cylindrical heads, one and a-half to over three inches in length, the individual flowers small and pink. Calyx tube with spreading hairs arising from tubercles, the rigid awl-shaped teeth erect; standard rather longer than the calyx; when in fruit the calyx teeth spread, giving a starred appearance to the spike.

For further particulars see plate.

Explanation of Plate.—A. Plant. B. Leaf and flower head. C. Flower. D. Calyx and section when in the fruiting stage. E. Seed.

NARROW-LEAVED CLOVER.
(*Trifolium angustifolium*, L.)

A Habit. B Leaf and Flower spike. C Flower. D Calyx. E Seed.
(A reduced; B about natural size; C, D, and E enlarged.)

HERD TESTING.

THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION SCHEME.

Conducted by Dairy Branch, Department of Agriculture, Western Australia—Result for Year ended 30th June, 1926.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				yrs. mths.			lbs.	%	lbs.	lbs.	
MATURE COWS—STANDARD 350LBS. BUTTER FAT.											
Mokine Fancy	T. H. Wilding ...	Jersey ...	8484	5 6	8-7-25	273	9,681	6·00	580·90	25½	Noble's Best of Garden Hill, 1756.
Fairy of Dardanup	R. H. Rose ...	do. ...	8942	7 4	1-1-25	273	10,664	4·69	499·87	23	Carnation's Masterp ece of Garden Hill, 2065.
Treasure 3rd of Homeleigh ...	D. Malcolm. ...	I.M.S. ...	4648	5 0	19-1-25	473	9,924	4·88	484·99	23	Defender of Homeleigh.
Gentle of Blackheath	Do.	M.S. ...	11679	5 0	3-10-24	273	9,903	4·49	445·42	11	Flowers' Mayfield of Blackheath, 370.
Gladness of Woolongbar	Department of Agriculture	Guernsey ...	452	6 9	28-7-25	273	8,139	5·02	408·87	23	George 3rd, 15.
Gentle of Blackheath	D. Malcolm ...	M.S. ...	11679	5 11	5-9-25	210	9,740	4·07	396·48	37	Flowers' Mayfield of Blackheath, 370.
Cheerful II. of Yaralla	A. H. Henning ...	Jersey ...	6258	8 8	16-10-24	273	6,657	5·49	365·67	19½	Retford Mariposa, 896.
Madge of Dalebank	D. Malcolm ...	do. ...	4759	12 3	31-8-25	210	6,270	5·08	318·93	21	Admiral, 1062.
Lady Mints' Gem 3rd of Garden Hill	W. Padbury ...	do. ...	8460	6 5	8-10-25	273	5,563	5·87	326·86	4½	Retford Magnet, 838.
Mermaid of Blackheath	D. Malcolm ...	M.S. ...	12156	5 2	19-2-25	273	7,212	4·38	316·41	19	Flowers' Mayfield of Blackheath, 370.
Boronia of Grass Vale	R. H. Rose ...	Jersey ...	9994	5 11	20-7-25	240	6,720	4·68	314·55	13	Noble Fondant of Garden Hill, 2238.
Madge II. of Dalebank	D. Malcolm ...	do. ...	8449	5 0	25-9-25	180	4,185	5·59	234·45	18	Makarini, 995.
Obligato	do.	do. ...	4694	10 6	9-11-25	150	4,320	4·92	212·73	26	Noble Lord, 320 (imp.)
Lily 3rd of Garden Hill	W. Padbury ...	do. ...	11661	5 3	16-9-25	60	2,430	5·12	124·53	39	Campaniles and Noble 840 (imp.)
Lotus Queen of Wongamine ...	Walker & Co. ...	do. ...	10064	6 1	20-5-25	90	2,010	4·74	95·31	14	Werribee Lotus King, 325
COWS (OVER 4½ YEARS AND UNDER 5 YEARS)—STANDARD, 325LBS. BUTTER FAT.											
Mokine Empire Lily 6th	T.H.Wilding ...	Jersey ...	10636	4 7	14 4-25	273	9,652	6·12	591·49	27½	Noble's Best of Garden Hill, 1756.
Mokine Empire Lily 5th	do.	do. ...	10635	4 9	22-5-25	273	8,304	6·66	553·83	23	Noble's Best of Garden Hill, 1756.
Morden Lady of Koojan	A. W. Padbury ...	Guernsey ...	722	4 8	12-4-25	273	8,817	4·19	369·71	24	Faust of Waterville, 221.
Mokine Lady Noble	Walker & Co. ...	Jersey ...	10633	4 10	2-11-24	273	6,361	5·61	357·03	15½	Noble's Best of Garden Hill, 1756.
Virginia of Nundorah	A. W. Padbury ...	Guernsey ...	775	4 10	30-8-25	273	5,811	5·67	329·99	17	Warrior of Nundorah, 322.
Lady Mint's Gem 4th of Garden Hill	W. Padbury ...	Jersey ...	10630	4 7	2-10-25	150	2,910	4·87	141·81	15	Macaw of Banyale, 1754.

COWS (OVER 4 YEARS AND UNDER 4½ YEARS)—STANDARD, 300LBS. BUTTER FAT.

Sheila of Sarnia	D. Malcolm ...	Jersey ...	8452	4	3	10–1–25	273	6,535	6·20	405·32	18½	Makarini, 995.
Pride 3rd of Blackheath	Sanatorium Farm...	M.S. ...	14419	4	2	2–5–25	273	8,979	3·67	329·92	23	Eclipse of Blackheath, 974
Lady Fowler 13th of Dardanup ...	D. Malcolm ...	Jersey ...	8986	4	4	9–6–25	273	6,727	4·90	329·74	17½	King George of Yalralla, 1271.
Velvet of Wollongbar	Department of Agriculture	Guernsey ...	774	4	5	25–10–24	273	6,996	4·57	320·13	12	Faithful Fido of Wollongbar, 81.
Alice of Blackheath	Sanatorium Farm...	M.S. ...	13069	4	3	4–6–25	273	6,879	3·70	254·66	8	Flowers' Mayfield of Blackheath, 370
Pet 8th of Glenview	D. Malcolm ...	I.M.S. ...	4647	4	5	2–11–25	150	2,985	4·20	125·52	13½	Cider of Glenview.

COWS (OVER 3½ YEARS AND UNDER 4 YEARS)—STANDARD, 275LBS. BUTTER FAT.

Mokine Empire Lily 7th	T. H. Wilding ...	Jersey ...	11794	3	11	12–7–25	273	10,164	5·69	579·11	28	Ettie's Chief of Banyule 1757.
Milton's Dulcie II.	A. W. Padbury ...	Guernsey ...	928	3	8	14–4–25	273	7,707	5·09	392·94	19	Langwater Illustrious 269.
Colleen of Rosewood	do. ...	do. ...	819	3	7	7–8–25	273	6,126	6·03	369·45	16½	Archer of Nundorah, 76.
Sweet Nell of Garden Hill	W. Padbury ...	Jersey ...	N.Y.A.	3	11	26–8–25	273	6,072	5·95	361·41	14	Macaw of Banyule, 1754.
Milton's Daisy 2nd	A. W. Padbury ...	Guernsey ...	922	3	11	28–6–25	273	6,787	4·96	338·82	17½	Wickham Golira ser, 214.
Pet 8th of Glenview	D. Malcolm ...	I.M.S. ...	4647	3	8	3–1–25	273	4,848	5·06	245·69	11	Cider of Glenview.

COWS (OVER 3 YEARS AND UNDER 3½ YEARS)—STANDARD, 250LBS. BUTTER FAT.

Mokine Clove Carnation	Walker & Co. ...	Jersey ...	11796	3	5	11–5–25	273	6,214	6·23	387·73	16½	Noble's Best of Garden Hill, 1756.
Carnation 3rd of Greyleigh ...	D. Malcolm ...	I.M.S. ...	N.Y.A.	3	2	28–2–25	273	9,360	3·92	367·31	25	Foch of Greyleigh.
Bonnie Margaret of Koojan ...	A W. Padbury ...	Guernsey ...	808	3	1	27–5–25	273	4,923	7·02	345·70	16	Gay Lad's Golden Dawn of Guildford, 162.
Morden Lady II. of Koojan ...	do.	do. ...	918	3	1	21–9–25	273	5,998	5·25	315·02	19½	Gay Lad's Golden Dawn of Guildford, 162.
Daisy 3rd of Garden Hill	D. Malcolm ...	Jersey ...	16852	3	4	20–9–25	180	4,305	5·48	236·04	18½	Silver King of Banyule, 2500.
Myrtle 12th Greyleigh	do.	I.M.S. ...	N.Y.A.	3	2	11–3–25	213	5,358	4·31	230·98	6	Foch of Greyleigh.
Fondant 14th of Garden Hill ...	W. Padbury ...	Jersey ...	15681	3	1	10–8–25	60	1,080	7·25	78·39	16½	Cream Socks of Glen Iris.

SENIOR HEIFERS (OVER 2½ YEARS AND UNDER 3 YEARS)—STANDARD, 225LBS. BUTTER FAT.

Mokine Columbine 2nd	T. H. Wilding ...	Jersey ...	14348	2	8	7–7–25	273	7,266	6·26	455·37	22	Ettie's Chief of Banyule 1757.
Juliet of Juadine	Walker & Co. ...	do. ...	14345	2	8	18–8–25	273	6,394	5·33	341·37	16½	Mokine Romeo, 2755.
Lily Rye of Grass Vale	R. H. Rose ...	do. ...	15697	2	11	7–10–25	273	6,082	5·44	329·95	12½	Rye Duke of Glen Iris, 1994.
Madge of Sarnia	D. Malcolm ...	do. ...	13437	2	11	24–7–25	240	5,775	5·55	320·73	20½	Obligato's King of Roelands, 2601.
Parson's Red Rose 31st of Wollongbar	Department of Agriculture	do. ...	985	2	8	6–7–25	273	5,658	5·33	301·52	16	Rose Boy of Woollongbar, 316.
Daisy Rye of Grass Vale	R. H. Rose ...	do. ...	15688	2	6	24–8–25	273	4,755	5·93	281·98	10	Rye Duke of Glen Iris, 1994
Countess 6th of Berry	R. Smith	M.S. ...	13347	2	11	1–1–25	273	6,078	4·05	246·34	21	Melba's Emblem of Darbalara, 461.
Bluebell 2nd of Cowra	do.	do. ...	13164	2	9	13–12–24	273	5,690	4·21	239·56	21½	Newhaven of Darbalara, 1174.
Primula 2nd of Berry	do.	do. ...	14434	2	6	14–12–24	273	4,615	4·47	206·61	8½	Rutland of Darbalara, 575.
Fancy Rye of Grass Vale	R. H. Rose ...	Jersey ...	15689	2	8	26–8–25	273	3,465	5·87	203·66	5	Rye Duke of Glen Iris, 1994.

HERD TESTING—*continued.*

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				yrs. mths.			lbs.	%	lbs.	lbs.	
JUNIOR HEIFERS (UNDER 2½ YEARS)—STANDARD, 200LBS. BUTTER FAT.											
Gibson Girl 9th of Berry	R. Smith	M.S. ...	13720	2 5	4-3-25	273	8,050	4·11	331·40	28½	Melba's Emblem of Darbalara, 461.
Peree's Rye Capture of Grass Vale	R. H. Rose ...	Jersey ...	15699	2 0	11-8-25	273	5,997	5·49	329·74	14	Rye Duke of Glen Iris,1994.
Rose of Waterside	Wooroloo Sanatorium	M.S. ...	14533	2 4	9-11-24	273	6,131	4·58	281·38	15½	Premier of Mayfield, 511.
Beauty Rye of Grass Vale	R. H. Rose ...	Jersey ...	15687	2 1	21-9-25	273	5,376	5·12	275·43	17	Rye Duke of Glen Iris,1994.
Myrtle of Cowra	R. Smith	M.S. ...	14234	2 0	27-12-24	273	6,300	4·36	274·64	20	Newhaven of Darbalara. 1124.
Peerless Lily of Juadine	Walker & Co. ...	Jersey ...	14347	2 4	30-5-25	273	4,837	5·62	272·76	16½	Peerless of Garden Hill, 2010.
Butterfly of Waterside	Wooroloo Sanatorium	M.S. ...	13900	2 2	29-11-24	273	6,142	4·43	272·23	17½	Premier of Mayfield, 511.
Cream Duchess of Grass Vale ...	R. H. Rose ...	Jersey ...	N.Y.A.	1 11	9-9-25	273	4,641	5·85	271·76	12	Rye Duke of Glen Iris,1994.
Bonnet II. of Berry	R. Smith	M.S. ...	13168	2 3	22-12-24	273	5,642	4·79	270·69	20	Newhaven of Darbalara, 1174.
Christmas Cake of Grass Vale ...	R. H. Rose ...	Jersey ...	N.Y.A.	1 9	25-9-25	273	4,027	6·51	262·48	12½	Rye Duke of Glen Iris,1994.
Pretty Polly II. of Cowra	R. Smith	M.S. ...	14414	2 5	1-1-25	273	5,675	4·55	258·31	21½	Newhaven of Darbalara, 1174.
Gem of Waterside	Wooroloo Sanatorium	do. ...	13701	2 5	21-8-25	273	5,973	4·24	253·83	16	Renown of Blackheath, 1782.
Lady Ettie of Juadine	Walker & Co. ...	Jersey ...	N.Y.A.	2 1	14-9-25	273	4,686	5·26	246·26	17	Ettie's Chief of Banyule, 1757.
Daisy Belle of Koojan	A W. Padbury ...	Guernsey ...	824	2 1	4-7-25	273	4,300	5·60	240·81	13½	Gay Lad's Golden Rule. 247.
Daisy of Koojan	A. W. Padbury ...	Guernsey ...	825	2 3	16-6-25	273	4,378	5·49	240·62	14½	Renown of Koojan, 414.
Joan of Koogan	do.	Guernsey ...	829	2 3	7-6-25	273	4,756	4·98	236·98	15½	Renown of Koojan, 414.
Topsy Rye of Grass Vale	R. H. Rose ...	Jersey ...	15702	2 5	17-9-25	210	3,960	5·81	230·25	11½	Rye Duke of Glen Iris.1994.
Daisy Rye of Grass Vale	do.	do. ...	15688	1 8	23-10-24	273	3,741	5·51	206·15	12	Rye Duke of Glen Iris,1994.
Rye Bread of Grass Vale	do.	do. ...	15700	2 5	8-8-25	273	4,044	5·03	203·70	8	Rye Duke of Glen Iris,1994.
Wooroloo Pride 1st	Wooroloo Sanatorium	M.S. ...	N.Y.A.	2 4	12-8-25	273	5,125	3·95	202·43	18½	
Ladybird of Grass Vale	R. H. Rose ...	Jersey ...	15695	2 5	11-8-25	273	3,226	6·25	201·68	5½	Rye Duke of Glen Iris,1994.
Madeira of Sarnia	D. Malcolm ...	do. ...	15678	2 0	2-8-25	240	3,060	5·60	173·49	10	Obligato's King of Roelands. 2601.
Mariposa of Yarralla	A. H. Henning ...	do. ...	13524	2 1	30-10-24	210	3,060	5·35	163·71	4	Werribee Fancy's Maderia's King, 1473.
Sunlight of Waterside	Wooroloo Sanatorium	M.S. ...	14724	2 2	24-12-24	273	3,510	4·53	159·14	10	Masher of Mayfield, 1473.

Treasure of Sarnia	D. Malcolm ...	M.S. ...	N.Y.A.	2	4	30-1-25	273	3,826	4·13	158·20	9½	Duke of Homeleigh.
Golden Cream 3rd of Roelands ...	R. H. Rose ...	Jersey ...	15690	1	11	30-5-25	180	1,800	6·43	115·89	6½	Brown Fern of Glen Iris, 1364.
Carnation of Koojan	A. W. Padbury ...	Guernsey ...	814	2	3	16-6-25	120	1,515	5·94	91·09	9½	Renown of Koojan, 414.
THREE HUNDRED AND SIXTY-FIVE DAYS' TEST.												
Fancy of Liryclea	A. H. Henning ...	Jersey ...	6674	6	10	24-7-24	365	11,210	4·91	550·57	25	Retford Mariposa, 896.
Girlie of Sarnia	D. Malcolm ...	do. ...	9992	5	4	21-8-24	365	12,750	5·17	660·00	27	Velvet Chief of Banyule, 2359.
Mokine Empire Lily 1st	T. H. Wilding ...	do. ...	11794	3	11	12-7-25	365	12,815	5·83	747·40	28	Ettie's Chief of Banyule, 1757.

POTATO CHIPS.

G. N. LOWE,
Senior Potato Inspector.

MORANDE SWAMP, NARRIKUP.

An instance of what has been accomplished by enterprise and pluck in draining 500 acres of swamp land in the Albany district, at a comparatively cheap cost per acre, has recently come under notice.

Morande Swamp, at the foot of the Porongorups and about eight miles form Narrikup Siding, has for some years been owned by Messrs. Williamson and Pugh, potato growers, who, some 2½ years ago, decided upon an effort to dispose of the water and turn it to use in producing potatoes.

Drain and mouth of 6ft. x 4ft. tunnel at Morande Swamp, Narrikup. The first "dump" of excavated earth is noticeable in the timber.

The only practical proposition appeared to be to tunnel beneath the surrounding high land, and thus to obtain the necessary out-fall. The shortest cut meant half-a-mile of tunnelling, but the work was put in hand, it being estimated that six months would elapse before completion. Six months passed four times before the water was finally flowing out from the south end, and

since the middle of October it is estimated that 1½ million gallons have been passing out daily.

The illustrations depict the mouth of the 6 feet x 4 feet tunnel on the edge of the Swamp and the outlet half-a-mile away. Between these two points are 18 shafts of an average depth of 20 feet, the deepest being 40 feet, from which the earth has been dumped from the tunnel below.

Outlet of tunnel draining Morande Swamp, Narrikup.

A surprising feature is that although the surface is sand and grows small jarrah chiefly, the soil from the tunnel is a rich red loam of adhesive character, and because of this, timbering has been practically obviated, except in the shafts.

About 100 acres on the edges of the swamp were already ploughed at the time of writer's visit, and Messrs. Williamson and Pugh expect to have the bulk of the area cultivated this summer for next season's cropping.

Notwithstanding the lengthy period occupied by the work, the cost amounted to only about £2 per acre for drainage.

Export Regulations.

As the export season is drawing nearer, growers should know that certain conditions must be observed to ensure certificates for consignments being obtained successfully. Without such, potatoes are not allowed exportation from the State.

New bags are essential, and these must be plainly stencilled with the name and address of the grower in letters not less than two inches in diameter. Tubers must be ripe enough to ensure successful carriage to their destination, and graded to exclude small stuff ("round seed") which detracts from the appearance of a line.

Analysis of "Delaware" from Young's Siding Experiment.

A chemical analysis of tubers drawn from each plot in the Young's Siding Fertiliser Trial with a view of ascertaining, if possible, the difference in starch content brought about by potash in the fertiliser application has been completed.

Calculated on dry matter the average starch content from tubers grown with the addition of potash shows as 66.6 per cent., whilst in the case of the plot without potash 56.4 per cent. was derived, or a difference of over 10 per per cent. It will be remembered that the crop responded in weight per acre to the application of potash, and this analysis shows the benefit accruing from the cook's standpoint.

A suggestion for storing Seed.

A householder at Cottesloe Beach keeps his supplies of potatoes for the table, during the hot months, by a very simple means, which might quite easily be applied to the storage of seed in the South-West for the summer planting.

The method employed is to fill petrol boxes with alternate layers of sawdust and potatoes, at the same time sprinkling the tubers with insectibane to ward off Potato Moth ("Fly").

Sawdust is easily obtained in the South-West, and being a non-conductor of heat will help to keep the seed cool and so tend to avoid "storage trouble" likewise. Dry sand might be used and carbon-bi-sulphide employed as a fumigant, as detailed in the "Potato Bulletin."

Planting in the South-West.

In the earlier districts such as Pinjarra, Benger, Roelands, and Burekup crops are beginning to show in rows, and indications are that an increase in the acreage of about 20 per cent. over last year, is probable.

Prospects of profitable export in November and December have given growers pleasurable anticipations, hence the heavier planting. Some loss, however, must have occurred through seed rotting in the ground, because of atrocious weather conditions at planting time, but apparently this is not as serious as was at first anticipated.

ROOT ROT OF FRUIT TREES DUE TO ARMILLARIA MELLEA.

W. M. Carne, F.L.S.,
Botanist and Plant Pathologist.

Armillaria mellea, a fungus of world wide distribution, is perhaps the most important cause of root rot in fruit trees in this State. It is distributed throughout the orchard areas. Citrus trees are particularly affected, though it is also found on stone fruits, apples, pears, grapes, mulberries, passion fruit, and even potatoes.

Armillaria mellea fruiting at the base of an orange tree which had been killed by the fungus.

The first indication of root rot is a sickly yellow colour in the foliage and a tendency for the trees to become sluggish and to die back. If the soil is removed and the roots exposed it will be found that some at least of the roots will be rotting to a jelly-like consistency. Black strands will be found running among the affected roots, half embedded in the tissues in the case of citrus, and running free on the surface in apples and stone fruit. *The presence of these black strands (rhizomorphs) on the roots is a certain guide to the identification of the disease.* If the bark of the affected roots, which becomes soft and loose, is removed, a layer of white fungus will be

found between it and the wood. Rotting spreads to the butts and up the stems. In an advanced stage of the disease clusters of mushroom-like bodies may be found, in the autumn and winter, at the base of the stem or where a root has been brought to the surface of the ground. These are yellowish or brown above and whitish on the underside of the cap. The caps may be from one to over six inches across.

When neglected the inevitable end of an affected tree is death.

Methods of Infection.—The principal and most important source of infection is the presence in the soil of roots or stumps of native trees, particularly the Marri or Red Gum (*Eucalyptus calophylla*). This tree has its roots commonly affected with the parasite, which has no apparent bad

Rhizomorphs on Nectarine root.
(Photo., N.S.W. Dept. of Agric.)

effect upon its growth. Infection is most likely where land is planted from which green Marri has been recently cleared. Wattles are also very liable to attack and suffer considerably.

Infected trees in an orchard are liable to infect other trees when their roots come in contact. The black strands of fungus pass from one tree to another.

The spores or seed bodies of the mushroom-like fungi may be blown to other trees and start infection.

Effect on Trees.—The fungus causes a rotting of the roots and butts, so that the tree suffers from want of food. Frequently only the roots on one side are affected, and the trees may live for years. In bad cases most of the roots are affected, and the rot spreads to the base of the stems, working round until the trees are ringbarked. Death occurs usually in the dry season.

Rhizomorphs on Citrus roots.
(Photo., N.S.W. Dept. of Agric.)

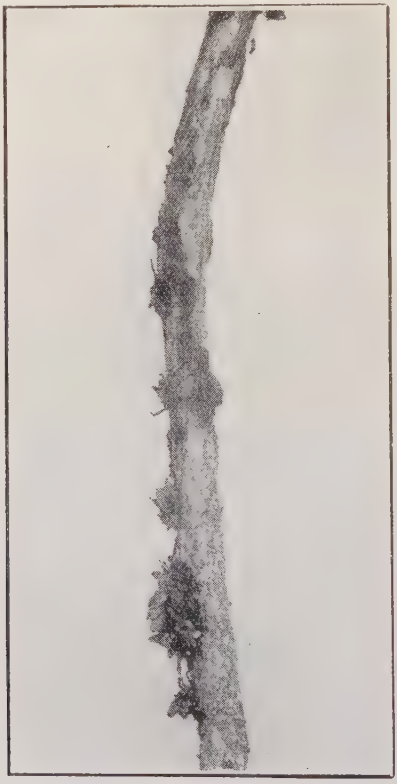
Confusion with Collar Rot.—Root Rot and Collar Rot are often confused. Collar Rot normally develops above the union of stock and scion, and does not extend down to roots. No *rhizomorphs* are developed. Root Rot starts with the roots and spreads up the stem from below ground.

Treatment.—As in all cases of disease, prevention is better than cure. *Root Rot in the majority of cases indicates rushed planting in improperly prepared land.* It means that stumps have not been properly grubbed or the roots followed up. Where time allows, several crops of cereals or vegetables should be taken off newly cleared land before planting trees, and drainage should be attended to. Bad drainage aids the fungus. Bush drains are, however, dangerous, as they may harbour the pest.

Badly affected trees should be dug up and burned on the spot, and the soil well dressed with quicklime or iron sulphate.

Slightly affected trees should have the soil removed from around the trunk so as to expose the roots. Affected roots should be cut off, followed up and removed. Rotted areas on the stem should be cut away, dusted with iron sulphate, or painted with bluestone paste made as follows:—Bluestone, 1½ lbs.; quicklime, 4 lbs.; water, 1½ gallons. Dissolve the bluestone in portion of the water and the lime in the remainder, and when cold mix to form the paste.

The soil around the tree should be well dressed with iron sulphate. The soil should not all be filled in, a hole about 18 inches from and around the butt of the tree being left open indefinitely. In citrus trees the branches may



Rhizomorphs and young fruiting bodies on Orange root.

also be cut up to about two feet from the ground to allow light to the butts. The idea is to allow access of light and air to prevent rotting, which will not take place when the butts and roots are dry and exposed to light. Trees treated in this manner have lived and borne for years without further apparent effects from the disease.

All *Armillaria* mushrooms should be destroyed when seen. A dusting of iron sulphate will kill them readily.

A CHAMPION BUTTER PRODUCER.

P. G. Hampshire,
Superintendent of Dairying.

The completion of the twelve months' test of Jersey cow "Mokine Empire Lily 7th" discloses the fact that she is the highest butter producing cow for her age of any breed in Australia as far as available records show. Mr. T. H. Wilding, of Mokine, Western Australia, who bred this cow and her mother, is to be congratulated upon the achievement.

The particulars of this animal's breeding, yields, and feeding, are made available in the following tables. As will be noticed, this young cow was milked only twice daily. She calved in good condition and retained her condition throughout the test. Her production has been very evenly maintained from the commencement; and during the last 3½ months of the test she carried a calf.

The tables set out the monthly butter fat yields, and prices ruling per lb. for butter fat, together with values of butter fat and skim milk available. As will be seen, the profit over cost of feed for this young cow for a twelve months' period is £37 6s. 3d., to which should be added the value of her yearling bull calf.

A SENIOR THREE YEAR OLD.

"Mokine Empire Lily VII.," To. 11794.

Breed: Jersey
Colour: Whole
Name: "MOKINE EMPIRE LILY 7TH," 11794
Owner's Name: T. H. Wilding
Age: Born 20th August, 1921
Bred by: T. H. Wilding
Address: Mokine, Western Australia

- Sire—"ETTIE'S CHIEF OF BUN YULE," 1757
  Bred by C. Gordon Lyon, Heidelberg, Victoria
  - G. Sire—"MABEL'S CHIEF," 623 (imp.)
    - G.G. Sire—"FONTAINE'S CHIEF," 4153, P.S.H.C.
    - G.G. Dam—"MABEL 47TH," 10616, P.S.H.C.
  - G. Dam—"ETTIE 4TH," 2889. Produced 9,756lbs. milk, average test 4·285, 417·21lbs. butter fat in 273 days
    - G.G. Sire—"TWYLISH'S PRIDE," 344.
    - G.G. Dam—"ETTIE"
- Dam—"MOKINE EMPIRE LILY 3RD," 10049
  Bred by T. H. Wilding, Mokine, W.A.
  Produced 6,206lbs. milk, average test 5·75 per cent.; 357·35lbs. butter fat in 273 days
  - G. Sire—"EMPIRE'S OPTICIAN," 2097
    - G.G. Sire—"OPTICIAN," 512 (imp.)
    - G.G. Dam—"EMPIRE" (imp.)
  - G. Dam—"JERSEY LILY 2ND"
    - G.G. Sire—"ROYAL SOVEREIGN 2ND," 68
    - G.G. Dam—"JERSEY LILY"

AGE OF COW AT COMMENCEMENT OF TEST—3 YEARS 11 MONTHS.

Month.	Milk.	Fat.	Butter Fat.	Milk for Month.	Butter Fat for Month.	Feed per Day each Month.
1925.	lbs.	%	lbs.	lbs.	lbs.	
Aug. 4	22½	5·8	1·305			6lbs. bran, 5lbs. oats (steamed), 5lbs. lucerne, 8lbs. oaten chaff.
	23½	5·4	1·269	1,380	77·22	Grazing on sub. clover and native grasses.
Sept. 1	22½	5·9	1·327			4lbs. bran, 1lb. pollard, 5lbs. oats (steamed), 8lbs. lucerne, 8lbs. chaff (wheaten and oaten.
	23½	5·3	1·245	1,380	77·16	Grazing on sub. clover and natural grasses.
Sept. 29	21½	5·2	1·118			6lbs. bran, 4lbs. oats (boiled), 8lbs. lucerne (green).
	23	5·4	1·246	1,335	70·92	Grazing on clover and native grasses.
Oct. 27	17	6·1	1·037			5lbs. bran, 6lbs. oats (steamed), 10lbs. lucerne, 8lbs. wheaten chaff.
	19½	5·8	1·131	1,095	65·04	Grazing on green oats.
Dec. 1	16	5·7	·912			1½lbs. bran, 10lbs. oats (steamed), 8lbs. lucerne, 4lbs. wheaten chaff.
	17½	5·4	·945	1,005	55·71	Grazing on Sudan grass.
Dec. 30	15½	5·4	·899			5lbs. bran, 7lbs. oats (steamed), 10lbs. lucerne, 6 lbs. oaten chaff.
	18	5·8	·972	1,005	56·13	Grazing on lucerne and natural grasses (dry).
1926.						
Jan. 26	17	6·2	1·054			5lbs. bran, 8lbs. oats (steamed), 10lbs lucerne, 10lbs. wheaten chaff.
	18½	5·6	1·036	1,065	62·70	Grazing on lucerne and natural grasses (dry)
Feb. 23	15½	6·1	·945			3lbs. bran, 10lbs. oats (steamed), 8lbs. lucerne, 14lbs. wheaten chaff.
	17	5·8	·986	975	57·93	Grazing on native grasses (dry).
March 26	13	6·2	·806			6lbs. bran, 8lbs. oats (steamed), 6lbs. lucerne, 10lbs. wheaten chaff.
	15	6·0	·900	840	51·18	Grazing on lucerne.
April 29	13½	6·0	·810			6lbs. bran, 6lbs. oats (steamed), 10lbs. wheaten chaff.
	15½	5·9	·914	870	51·72	Grazing on lucerne.
May 25	14¼	7·0	1·015			5lbs. bran, 7lbs. oats (steamed), 8lbs lucerne, 10lbs. wheaten chaff.
	15	6·4	·960	885	39·25	Grazing on lucerne and natural grasses.
June 22	13	6·8	·884			6lbs. bran, 10lbs. oats (steamed), 12lbs. wheaten chaff.
	15	6·0	·900	980	62·44 (35 days)	Grazing on lucerne and natural grasses.
Total ...	...	5·83	...	12,815	747·40 equal to 900·59 Commercial Butter	NOTE.—Lucerne grazing was a sparse stand and unsuitable for cutting.

Cow calved in good condition and retained her condition throughout the test; has carried calf for the last three months of test. Twice a day milking.

MONTHLY RECORD OF COSTS OF FEED AND RECEIPT FOR PRODUCTION.

Cost of Feed	Butter Fat Produced.	Price per lb.	Value.	Milk Produced.	Skim Milk.	At 2d. per gallon.	Value.	Total Value.
£ s. d.	lbs.	lb.	£ s. d.	gall.	gall.		£ s. d.	£ s. d.
2 4 4½	77·22	1 7½	6 5 5	138	94	2d.	0 15 8	
2 3 6½	77·16	1 6	5 15 9	138	94	...	0 15 8	
1 16 8	70·92	1 6	5 6 5	133½	90	...	0 15 0	
2 6 5	65·04	1 6	4 17 6	109½	68	...	0 11 4	
2 0 7	55·71	1 4	3 14 4	100½	60½	...	0 10 1	
2 6 5	56·13	1 3	3 10 2	100½	60½	...	0 10 1	
2 12 1	62·70	1 4½	4 6 3	106½	96	...	0 16 0	
2 12 10	57·93	1 6½	4 9 4	97½	88	...	0 14 8	
2 12 7	51·18	1 8	4 5 4	84	75½	...	0 12 7	
2 10 10	51·72	1 9	4 10 6	87	79	...	0 13 2	
2 9 2½	59·25	1 8	4 18 9	88½	80	...	0 13 4	
2 14 11	62·44	1 10	5 14 6	98	89	...	0 14 10	
28 10 5½	747·40	...	57 14 3	1,281½	974½	2d.	8 2 5	65 16 8

Less cost of feed 28 10 5

Profit 37 6 3

NOTE.—*Re* Skim Milk—Less 10 per cent. for cream, less 30 gallons per month for six months.

PREPARING SHEEPSKINS FOR MARKET.

HUGH MCCALLUM,
Sheep and Wool Inspector.

A large amount of money is lost annually to sheep farmers owing to the carelessness with which sheepskins have been treated, and though more attention is now being paid to the preparation and care of the skins, there is still room for improvement in a large number of instances.

The difference between damaged and sound values is anything from 2d. to 3d. per lb., and it can therefore be readily seen that the loss incurred by owners is simply for the want of a little care and knowledge in the get up of their produce.

In the first place the sheep should be carefully and thoroughly skinned, the knife should be used but sparingly, for in using a knife slips are liable to be made, thereby damaging the pelt, and so the value of the skin is lessened considerably. The knife is only needed about the neck, belly and legs. The skinning should be done as much as possible by using the hand, same being speedily and more effectually removed from the carcase, and without having unsightly lumps of fat and flesh adhering to the pelt.

Every care should be taken to prevent the wool becoming smeared with blood and mixed with rubbish. When possible the sheep should be killed on a grating with gallows attached.

Hang the skin in the shade on rails, head and tail pelt side up, tuck the tail under to prevent curling and open out the points, as the neck, legs, and edges of the skin are inclined to curl. Constant attention is necessary to

No. 1.—A well prepared sheep skin showing pelt free from faults.

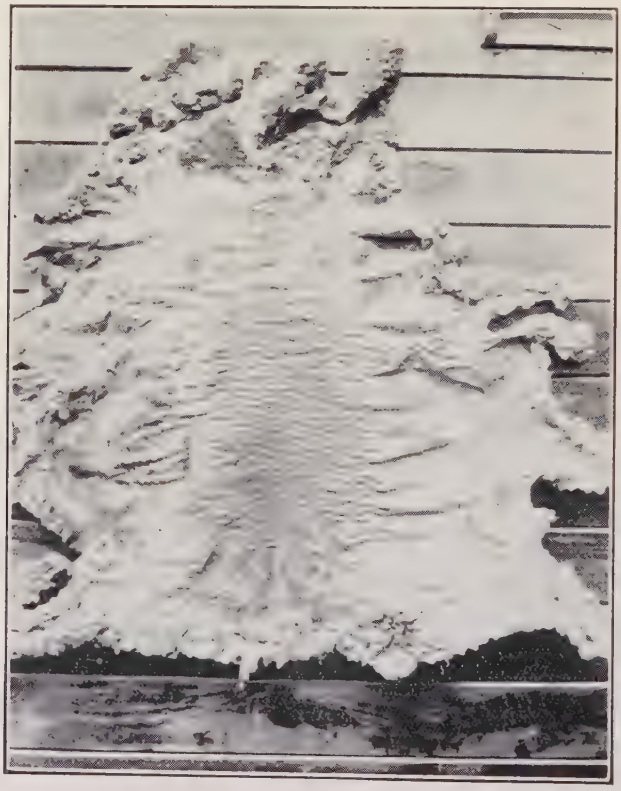
keep these parts well exposed to the air to ensure even drying. The floor of the shearing pens is also a convenient place for skin drying. The skins should be painted with an improved arsenical solution to destroy weevils, as the weevils very quickly attack, and once a skin is eaten through the pelt is destroyed as a basil.

Good clean packing is most essential; all skins should be perfectly dry before being packed; if this is not so, they are liable to taint, and therefore become damaged. Cut off all trotters and leg pieces, fold lengthways—wool side out, pack in convenient sized bundles for handling, fastening the bundles with rope or wires. When consigning, advise broker of the consignment, the total number of bundles, and state the number of skins, also the

weight. Label each bundle separately and securely. On arrival at the broker's store the skins are checked to advices received, and classed into their respective grades, the weight and separate number of skins being recorded. They are then given a lot number together with others of the same grade of various owners until the time of auction.

It may interest the farmer to know that in classing sheepskins the length of staple, condition of the wool, quality and also condition of the pelt must be taken into consideration.

The brokers issue catalogues to prospective buyers, showing the lot number, the number of skins, and the total weight, also the average weight



No. 2.—A badly prepared sheep skin, ribby, perished and weevil eaten.

per skin. The lots are then opened for buyers' inspection. The buyers value the lots and place their values in a column set apart for that purpose, and are entirely guided at the auction by their own priced catalogues. Sheepskins are classed into the following grades:—Full wools, three-quarter wools, half wools, quarter wools, pelts and shearings (Merino separate from Crossbreds), ribby, seedy and burry, separate from free skins (damaged and broken). The above constitute Merino lines. This applies to Crossbreds, fine, medium and strong as well as the various lengths.

CABBAGE PRODUCTION IN VIRGIN BULRUSH PEAT SWAMPS.

A. C. Townsend,
Narrikup

On newly-drained bulrush peat swamps it is frequently found that, owing to the boggy nature of the soil, it is impossible to immediately work horse teams for "breaking-up"; if, however, something can be produced in the rushes for one season, it will be found that the peat settles down, and in the season following it can be ploughed successfully.

The production of cabbages on the system described below not only tends to settle the peat for "breaking-up" with the plough next season, but also proves highly remunerative to the grower, when under ordinary circumstances the soil would have to remain idle, probably until an exceptionally dry season, before the horses could be worked upon it.

In planting the seed bed allow about six weeks before the transplanting period. Quarter pound of seed, provided good germination follows, will furnish sufficient seedlings to plant out one acre.

The bulrushes are scythed down, and can be burned with safety if the ground is wet, otherwise the cut rushes should be rolled into long heaps running parallel with the direction later intended for the planting of the rows. This means the loss of the use of a little land certainly, but it does not amount to much.

The next operation is to stretch a wire or line from one end of the plot to the other, and along it, at intervals of about two feet, to cut small holes with a mattock, any rushes in the way, of course, being disposed of. In the holes made by the mattock, place the fertiliser at the rate of one handful to every six or eight plants. Thoroughly mix the fertiliser with the soil, and then place the seedling in position. Distance between the rows should be three feet, and after every 30 rows a space of five feet should be left;

the reason for this will be shown later when the method of harvesting is explained. The fertiliser mixture used is 20 lbs. sulphate of ammonia to 1 cwt. superphosphate which, applied at the rate above, runs out at approximately 5 cwt. per acre.

The varieties suggested are Henderson's Succession and Yates' Early Drumhead, and both proved heavy yielders; the latter, however, are favoured on account of better carrying capacity, which enables them to open up better in the market, and so command higher prices.

From the middle of December to the middle of January appears to be the best time of planting, as this allows, in the average season, for the complete harvesting of the crop without the risk of flooding. The period of growth is approximately 12 to 14 weeks, the prices, moreover, are invariably good for cabbages produced during this season.

In the initial stages, the method of carrying the produce off to a packing place at which was a horse and cart or wagon was adopted. However, after a few tons had been removed by this method, it appeared that something more than brute strength and stupidity were required to cope with the situation.

As a result the following system has been substituted, and has proved satisfactory, especially as it has expedited handling. Large consignments can now be forwarded, and cutting can be delayed later if necessary than was the case early in the business. In describing the method of planting, it will be remembered, with reference to the spacing, that five feet was to be left after every 30 rows were planted. Along these spaces a wooden tram track is laid, being constructed of 3in. x 2in. jarrah, made up in sections of 10ft. to 12ft. These lengths of 3in. x 2in. jarrah are nailed to three sleepers of 9in. x 1in. timber. The sleepers are placed so that one end of each section stands out sufficiently to allow of overlapping. This end sleeper thus provides a suitable base for the overlapping portion of the abutting section of line. The distance between the rails of the line is 20in. A truck with four flanged wheels is constructed for use on the line. The truck has an ordinary flat top, and on this is fitted a four-sided detachable crate, and the cabbages are packed into this and conveyed to a suitable packing site—packing can, of course, be carried out in several convenient places, and the filled bags placed on the table top of the truck and taken to the cart for transport.

When a section of 15 rows of cabbages has been cut on either side of the track, the line can be taken up and placed in position along the next 5ft. space.

During packing the bags are suspended beneath a tripod carrying a pulley block at the top. On the rope extending from the pulley is a hoop with four spikes, and to them the top of the bag is attached. The bag is swung clear of the ground and packed. When filled bags will weigh between 140 and 160 lbs. The weight contained naturally depends on the size of the cabbages which, if of large size, will take 18 to 22 to fill a bag, whilst with medium-sized cabbages about 25 will be required.

In cultivating cabbage under these conditions the experience has been that practically no pests attack the crop, except in very dry seasons when aphis has made an appearance.

The accompanying illustrations serve to give a general idea of cabbage cultivation as outlined.

From an area of two acres 37 tons of cabbages were harvested to a gross value of £345. The cost of production and harvesting was estimated at £25 10s. per acre, made up as under:—

	£	s.	d.
Seed	0	7	6
Scything and transplanting	9	0	0
Fertiliser	2	0	0
Bags and packing	9	2	6
Carting	5	0	0
	£25	10	0

It will therefore be seen that a net profit of £147 10s. per acre was cleared. Allowing 15 bags to the ton, the average price returned was 12s. 6d. per bag.

Cabbages have been grown as described in this article for six years as a catch crop, and during the whole period never, even with low markets, has there been cause for complaint.

Good business has resulted by direct sales to greengrocers in country towns on a flat rate basis, apart from forwarding to market under ordinary conditions.

It might be mentioned in passing that peas can also be profitably produced on similar soils, but these would have to be cultivated in shallow trenches.

BROOM MILLET.

POSSIBILITIES IN THE SOUTH-WEST.

G. K. BARON-HAY, B.Sc. (Agric.),
Agricultural Adviser.

Prior to 1925, portion of the fibre used in the manufacture of brooms in Australia was imported, mostly from Italy. In 1924, however, a shipment of broom millet fibre from that country landed in Victoria severely infested with live moths and grubs of the European Corn Borer (*Pyrausta nubilalis*). This is one of the most destructive insect pests in the world, attacking maize, sorghums, millet, hemp, hops, and other crops. To prevent the importation of this dreaded pest, the Commonwealth Government, on 11th June, 1925, prohibited the importation of broom millet fibre into Australia.

Australian manufacturers, therefore, are now dependent on local supplies for their requirements, which approximate 450 tons per annum, of which 60 tons are required in this State. At present, practically no broom millet is grown in this State, and local industry has to import all necessary fibre from the Eastern States.

Illustration 1—Demonstration Plot, Group 113, Denmark.

It is believed that local requirements can be produced profitably in this State and would be a useful sideline to farmers in the wetter districts. With this end in view, last spring, the Department of Agriculture, in co-operation with the W.A. Brushware Company, initiated experiments in various parts of the State with the view of demonstrating the suitability of this crop to local conditions.

Demonstration plots were carried out at the following centres, the size of the plot in each case being one-quarter acre, and seed sown at the rate of 4-5lbs. per acre:—

Districts.	Date Planted.	Type of Soil.	Date Harvested.	Rainfall, Sept., 1925-Mar., 1926.	Remarks.
	1925.				
Harvey	Oct. 21 ...	Brown Clay Loam	March 18	10·75	Good growth and well formed heads. Thin in rows.
Baker's Hill ...	Oct. 31 ...	Brown loam. Red gum timber	March 5	5·34	Cultivation poor. Ground too dry. Yielded 1½ cwt. per acre.
Denmark, Group 41	Early Nov.	Grey sandy loam	...	21·31	Affected by aphis. Grew satisfactorily.
Denmark, Group 58	Early Nov.	Red load. Karri flat	Mid-April	21·31	Grew exceptionally well. Planted too late to fully mature.
Denmark, Group 113	Early Nov.	Peaty swamp ...	Mid-April	21·13	Grew exceptionally well. Planted too late to fully mature.
Manjimup, Group 10	Oct. 24 ...	Brown loam. Good soil	March 20	14·62	Good growth and good sample of fibre harvested. Planted too late for full maturity.
Bridgetown ...	Nov. 5 ...	Red gum and jarrah. Brown loam	...	11·56	Failure owing to dry conditions.
Bullsbrook ...	Sept. 1–7	Red loam ...	Jan. 27	Nr. Perth	4¼cwt. of good fibre per acre.
Donnybrook ...	Dec. 22 ...	Red loam ...	April 30	13·67	5cwt. per acre. Conditions rather dry.
Bullsbrook ...	Oct. 14 ...	Banksia semi-swamp. Sandy	...	Nr. Perth	Failure. Conditions too dry.
Margaret River, Groups 12, 60, 61	Early Nov.	Damp Karri red loam. Virgin soil	...	14·17	Grew well in early stages, but planted too late for full maturity.
Augusta, Group 69	Early Nov.	Good red loam. Virgin soil	...	...	Growth stunted. except where stable manure applied.
Peel Estate, Group 71	Oct. 28 ...	Black peat swamp Virgin soil	...	9·15	Plants failed to grow, except where stable manure applied.

Owing to the difficulty experienced in obtaining seed, which had to be procured from the Eastern States, planting in the majority of cases was carried out too late in the spring, either for obtaining the best results in germination or allowing the plants to attain their full maturity. It is hoped that planting will be completed this year by the end of September.

The Department has available a limited quantity of broom millet seed for distribution to farmers willing to carry out a trial during the present season, and farmers desirous of planting a trial plot should make application as early as possible.

Broom Millet Competition.

The W.A. Brushware Company, Fremantle, in order to stimulate the growth of this crop, has offered a prize of £5 for the best 1 cwt. of millet fibre received at their factory, 96 Duke Street, Fremantle, and grown during the coming season.

The following are the conditions of the competition:—

1. The package of fibre, not less than 1 cwt. in quantity, to be received at the factory not later than 30th March, 1927.

2. The sample will be judged by the following scale of points:—

(a) Quality of fibre to be judged on the basis of fineness and length	20	points
(b) Colour of fibre	10	„
(c) Freedom from seeds	10	„
(d) Length of stalks	5	„
(e) Packing	5	„
Total	50	„

The following notes on the cultivation of broom millet will be of value to farmers who intend growing a trial plot this year, or to compete in the above competition.

Climate and Soil.

Soils and climate suitable for maize are also adapted for broom millet. The best quality "brush" would be produced on well drained alluvial soils, although sandy swamps will produce first quality brush if proper cultivation methods are employed. It is essential for the plant to be able to obtain adequate moisture during the growing period.

An absence of rain during the ripening period and at harvesting is essential for the best results, and these conditions obtain generally in this State during the months of February and March.

Broom millet, in common with other sorghums, has the ability to withstand drought conditions, and will produce fair crops in seasons when maize would not mature. This was well illustrated last season in a plot at Bridgetown, alongside which a crop of maize was planted. Although cultural conditions were identical, while the broom millet grew 6-7 feet high, the maize did not attain half this height.

Preparation of the Land.

Fallowing, followed by thorough cultivation to destroy weeds, is very necessary. Where the soil contains a large percentage of clay, as on river flats, ploughing should be deep, not less than 5 inches.

After ploughing, the land should be brought to a fine tilth by the use of harrows, including the disc harrow, if necessary, to pulverise pasture land.

Date of Planting.

Broom millet will not withstand frost, and seeding therefore should be delayed in the spring until the ground is warm and danger from general frosts is past. This time will vary in different parts of the State.

In the main part of the Dairy Belt, planting should not be delayed later than October. Where broom millet was planted later than this date last season, the cold autumn conditions prevented the plant from fully maturing.

In the Denmark area and that narrow coastal strip where frosts are rare, planting may very well be carried out in September. Approximately 5 months is required for the plant to attain maturity.

Manuring.

Broom millet is a gross feeder, and the soil should be well supplied with those plant foods most commonly deficient, namely, nitrogen (in organic matter), potash, and phosphoric acid.

The character of the soil would to a certain extent influence the system of manuring. Clay soils are usually well supplied with potash, swampy soils usually contain abundant organic matter, while sandy soils would lack both these constituents. It may be taken for granted, in Western Australia, that a phosphatic manure will be required on all soils. Farmyard manure can

Illustration 2—Demonstration Plot, 11-Mile Swamp, Group 113, Denmark.

be applied with advantage and the plant will stand heavy dressings with safety. Because of this, broom millet is a suitable crop to succeed a crop of field peas or subterranean clover. Generally an application of 2 to 3 cwt. per acre superphosphate, with ½ to ¾ cwt. per acre sulphate of ammonia is recommended. On sandy soils this may be further supplemented with ½ cwt. per acre sulphate or muriate of potash.

Seeding.

The seed should be planted in shallow drills 3ft. 6in. or 4ft. apart, according to the district and quality of the land.

Seed may be sown either by hand or with a machine, the single row maize planter, which may be fitted with suitable plates, effecting the purpose well. Machine planting is preferable as it sows the seed regularly, buries it at a uniform depth, and compacts the soil around the seed, thus assisting quick germination.

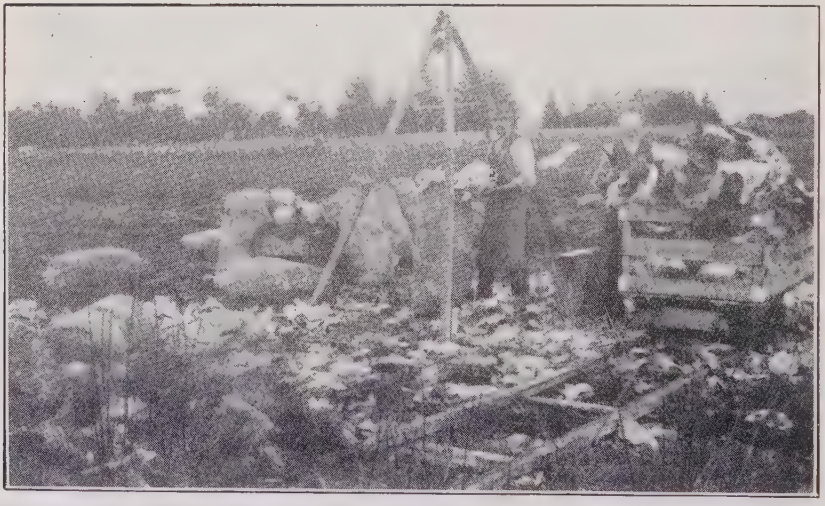
Care should be taken to plant the seed deep enough to place it in the damp soil beneath the dry surface mulch, generally 1 to 1½ inches deep.

With a drill, using sound seed, approximately 4 lbs. per acre will be required. When the seed is planted in the drills by hand, the quantity should be increased to 6 lbs. per acre.

When plants are 8 inches high, they should be thinned out to 4 inches between them on good soils and up to 8 inches on poorer types of soil. Thinning out of the plants is reflected in the quality of the fibre; a thick stand produces spindly and weak thin fibre.

Good cultivation of the soil between the rows is necessary to keep down all weed growth, and to retain moisture. Intertillage should commence early, and continue, especially after summer showers, till the seed heads are forming. At this latter stage the plant requires good conditions for growth, as the brush is directly affected by reverses at this stage.

(*To be continued.*)



HORTICULTURAL AND VITICULTURAL NOTES.

GEO. W. WICKENS,
Officer in Charge Fruit Industry.

SEASONAL WORK FOR OCTOBER, NOVEMBER, AND DECEMBER.

October.

Cultivation in the orchards needs every attention this month. Ploughing and cross-ploughing will have been completed in September, and the cultivator must be kept going unless prevented by rain. Should rain occur the cultivator should be used again as soon afterwards as the land is dry enough to work without becoming sticky.

The winter rainfall of 1926 has been well over the average in all fruit-growing districts, and if the top soil from four inches to six inches in depth is kept in a thorough state of tilth during the summer months sufficient soil moisture will be retained for tree growth and fruit production, even should the summer turn out more than usually dry.

The land around the trees which cannot be reached with the cultivator or other horse-drawn implements must be freed from weeds and loosened with a digging fork or pronged hoe.

Young trees in newly planted orchards require special attention, and hoeing should be lightly done so as not to disturb the roots which are now making new growth.

Insect pests and fungus diseases feel the genial effects of spring this month and reproduce abundantly, needing constant watchfulness and care to keep them under control.

Pear Scab and Powdery Mildew of the apple, amongst the fungi, and Fruit Fly and Orange Aphis, amongst the insect pests, are some of the most important requiring attention at this time of the year.

There is one other pest which must be mentioned—Codlin Moth—and though this at present is confined to a small area in the State, there is no gainsaying the fact that the Collie outbreak is a serious one, and just as the pest has been introduced there (most probably in packages of merchandise) so may it be introduced into any other town or district, and all growers should be constantly on the alert and notify the Department immediately any suspicious signs are observed.

November.

Continue cultivation.

Destroy infested fruit and bait and trap for Fruit Flies.

Woolly Aphis will show up in quantities this month unless controlled by parasites or spraying: where parasites are not present spraying must be resorted to, or the pest will destroy the young buds and materially interfere with the crop of fruit to be harvested.

Spray for Pear Slug this month, using 2½ lbs. arsenate of lead in 50 gallons of water.

Commence thinning fruit this month, beginning with early peaches and apricots and following on with apples and pears.

December.

Continue cultivation.

Complete the work of thinning out apples and pears.

Carry on the war against Fruit Fly.

Take special notice of, and report at once, everything that resembles Codlin Moth or its larvae.

Spray for Orange Aphis where necessary. The heat of summer will, no doubt, have a checking influence on the pest this month, and spraying may not be necessary, but where needed it is false economy not to apply it.

Marketing will be the principal work in the stone fruit orchards this month, and the better the fruit is graded and packed the better will be the prices obtained. Grade evenly and never mix small and large fruit in one case: never mix first and second class fruit in one case, and never send to market very inferior fruit, which depresses prices of good fruit, causes gluts, and robs the pigs which should be kept on the orchard of their just dues. It is very, very rare indeed that a glut of really good fruit occurs, but there is always a very limited market for rubbish.

SOUP MAKING.

MISS M. A. WYLIE,

Instructress and Organiser Domestic Science, Education Department.

Soup making is an art which is not always understood by ordinary cooks. It is, however, an art easily acquired and one which is of value not only to the menu but proves itself interesting from the standpoint of the epicure. Soup forms the prelude to the meal and stimulates the flow of the digestive juices. It helps to supply some of the water which is required for the body, and if carefully made is an aid to its general nourishment.

Soup is a liquor holding in suspension particles of goodness from meat, bones, vegetables, and cereals with special flavourings or seasonings to suit the variety. It can be made with inexpensive materials with excellent results; it can also be made with costly materials but with poor results. The excellence of soup depends largely upon the long slow cooking of the foundation materials and the wise introduction of seasonings and garnishes.

The foundation of all good soups is termed "stock." Stock is the liquor in which meat, bones, and vegetables have been simmered for a long time to extract their juices which contain nourishing material such as albumen, gelatine, and also mineral salts and flavourings.

The preparation of stock differs according to requirements. The methods employed in large hotels, for instance, would be totally different from those of a small private home. In a hotel where perhaps 40 lbs. of meat is used, a large stock pot would be in constant use. In a small home a saucepan is all that is necessary.

Stock may be divided into three classes, viz.:—

First Stock—Strained liquor from the first boiling of materials.

Second Stock—Fresh water and second boiling of meat and bones.

Light Stock—Made from boiling white meats, such as fowl.

To bring about extraction of goodness from the materials used it is necessary to put them into cold water and very gradually bring them to boiling point, then let them simmer only. A long slow cooking from three to four hours at least is required.

Here is a simple recipe for making stock. To every pound of meat and bones use 1½ to 2 pints of water.

1 onion,
1 carrot,
1 turnip,
1 stick celery,
1 dessertspoon salt,

and a bouquet garnish, tied loosely in muslin, which is composed of:—

1 blade of mace,
1 sprig of thyme,
1 sprig of marjoram,
6 peppercorns,
4 cloves,
1 bay leaf,
1 snip of lemon rind.

The liquor in which a leg of mutton has been cooked (simmered) with its accompanying vegetables makes a good foundation for soup. In the case also of corned beef, some of the liquor in which the meat has been cooked may be used for soup such as pea soup. The present day prices of meat are high; it is therefore to the advantage of the housekeeper to use bones of cooked meat for stock. A large amount of nutriment is therefore saved and used to good account. The bones should be broken into short pieces, placed in a saucepan with cold water, fresh vegetables added, and simmered for two or three hours. The addition of a little extract of beef will make this stock richer. Milk is sometimes used instead of stock for white soups. When the other ingredients are rich water is sometimes used instead of stock.

The straining process of stock is an important one. It can be done (for ordinary work) by means of a wire sieve or a colander. The meat and vegetables after yielding their extractions are no longer of use. The strained liquor should be allowed to get quite cold and then the fat skimmed from the top.

For clear soups of the high class varieties stock requires special treatment to clarify it. Space, however, will not permit of a treatment of this section of soup making, but directions for the work will be found in any high class cookery book.

Good stock when it is cold should form a jelly. This is owing to the presence of the gelatine in the meat and bones. It should have a light amber colour, and before use be quite free from fat. During the process of cooking stock it should be skimmed. Debris rises from time to time, and if allowed to remain spoils the clearness and colour of the stock.

The stock pot or pan should be washed every day.

Soup Making.

Soups are frequently named according to the particular garnish they contain or to their predominating flavour. Generally speaking there are three classes of soup:—

1. Purées.
2. Thickened soups.
3. Broths and clear soups.

We have not an English word that conveys exactly the same idea as the French word purée, and so we often use the word soup when purée would convey a better meaning. A purée is distinguished from a thickened soup in that it owes its consistency to the fact that its ingredients have been passed through a sieve or straining cloth, as in the case of tomato soup, green pea soup, lentil soup. The actual thickening of the stock in these soups is due to the material they contain. Thickened soups on the other hand owe their thickening to outside means such as flour, cornflour, arrowroot, or brown roux. Broths are unthickened, that is to say, they should appear, clear and sparkling and yet have a body somewhat like wine. They may have starch material.

Purées—Tomato Soup.

Ingredients:

2 lbs. tomatoes.
1 onion.
2 pints stock or water.
1 teaspoon salt.
pinch cayenne.
½ teaspoon nutmeg.
1 slice bacon.
Bouquet garnish.
1 oz. butter or dripping.
1 oz. flour or 1 tablespoon sago.
1 tablespoon sugar.
½ pint milk or 2 tablespoons unsweetened condensed milk.

Method:

1. Cut up onions and tomatoes roughly.
2. Melt fat in saucepan, add vegetables and bacon, fry (sauté) for 5 minutes. Do not brown.
3. Add stock or water, seasonings and herbs. Simmer till vegetables are tender.
4. Strain through a sieve or colander, press goodness out of vegetables.
5. Return liquor to saucepan, add sago or stir in flour which has been mixed to a smooth paste with cold water.

6. When sago is cooked draw to one side of fire.

7. Just before serving, and when soup is quite off boiling point, add milk, cream, or undiluted unsweetened milk, gradually.

8. Serve in a hot tureen with fried bread in dice or sippets.

Green Pea Soup.

½ lb. shelled peas.
½ doz. spinach leaves (or ½ lb. pods of peas).
1 small onion.
1 sprig parsley.
1 sprig mint.
1 teaspoon salt, pepper.
1 oz. butter or good dripping.
1½ pints second stock.
½ pint milk.
1 tablespoon flour.

Carry out the same method as for tomato soup.

Thickened Soup—White Vegetable Soup.

1 quart second stock.
1 carrot.
1 onion.
1 stick of celery.
1 tablespoon flour.
1½ teaspoons salt.
Pepper.
1 tablespoon chopped parsley.
1 tablespoon butter or dripping.
1 cup milk.

Method:

1. Melt fat in saucepan, add flour, mix till smooth; do not brown.

2. Add stock gradually, stirring till blended with flour. Add pepper and salt.

3. Peel vegetables, cut onion in rings and other vegetables in match strips.

4. Add onion to stock, simmer 15 minutes.

5. Add other vegetables, simmer for 15 minutes longer. (Vegetables must be tender, not broken.)

6. Draw pan to one side, add milk gradually.

7. Pour into hot tureen. Sprinkle with chopped parsley.

Broth—Sheep's Head Broth.

1 sheep's head.
3 quarts water.
1 large carrot.
1 turnip.
2 onions.
2 sticks celery.
4 sage leaves.

2 tablespoons wheat meal.
½ cup rice or barley
1 tablespoon salt.
Pepper.

Method:

1. Wash in cold salted water.
2. Remove nose bone, lay head in water to soak 1 hour.
3. Remove brains and soak separately.
4. Put head, water, and salt in pan, bring slowly to boil.
5. Peel vegetables and cut into dice.
6. When liquid boils, remove scum, add vegetables, pepper, rice or barley, simmer 3 hours.
7. When soup has simmered for 2 hours, mix oatmeal with a little cold water and add.
8. Tie brains and sage leaves in muslin and add.
9. Remove head and brains, serve soup in a hot tureen.
10. Cut meat off head, skin and slit tongue, arrange on hot dish. Chop brains, place on tongue, serve with white sauce.

MATTRESS MAKING.

Material.

1. Belgian linen ticking the best. English ranges next.
2. Belgian linen or cotton and flax mixture.
3. Ticking may be purchased in various widths and qualities, 72in., 63in., 54in., 36in., 30in.

Standard Sizes of Bedsteads.

6ft. x 2ft. 6in.
6ft. x 3ft.
6ft. 6in. x 3ft. 6in.
6ft. 6in. x 4ft. 6in.
6ft. 6in. x 5ft.

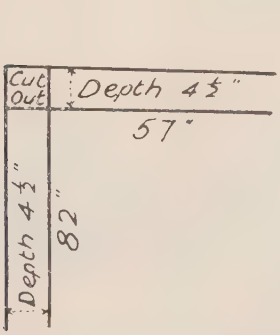
Method of Making Mattress.

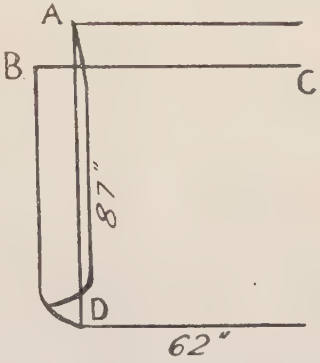
1. Measure the bedstead: (a) length from inside posts top and bottom. (b) width edge, to edge.
2. If mattress is to be tufted allow ¾in. extra to each foot length and width.
3. Usual depth for box sides, 4½ inches.

Cutting Material.

1. Square the weft edges with ruler or T square from the selvedge edge and cut straight.

2. Cut two pieces the length plus the depth of mattress by the width plus the depth of the mattress, *e.g.* (6ft. 6in. x 4ft. 6in. bed), 78in. x 54in. = 82in. x 57in. for tufting = 63in. material most economical. 4⅞ yds. of 63in. will just exactly cut this mattress.





1. Pin together the two sides A and B, where the corner has been cut out, make snip at corner and machine.

2. Bind with mattress binding, also bind lines C and D.

3. Now pin top and bottom together, fitting the two corners together carefully.

4. Machine, leaving opening large enough to get hand in for filling.

5. When well filled, close opening and bind the remaining edge.

Materials for Filling.

1. Duck down.
2. Horse hair.
3. Wool and hair mixed.
4. Kapok or cotton.
5. About ¾ to 1 lb. to the square foot.
6. Fill corners first, push well up with a quilting needle.
7. Tease the filling well first to free from lumps.

Tufting and buttoning—

1. Tufting and buttoning the mattress keeps mattress firm and even.

2. Make plan as to number of buttons desired, about 10in. between each tuft.

3. Thread a double-pointed upholstering needle with mattress twine and put it perpendicularly through the first mark, take a ¼in. stitch back, place a tuft of leather under the loop of twine and tie a knot over a similar tuft on the opposite side.

4. Repeat at each mark as desired.

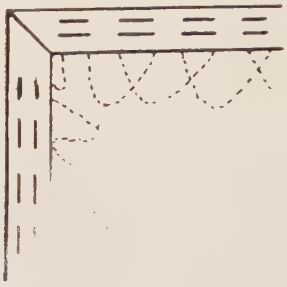
Quilting—

1. Quilting is the process by which the filling is held to the side of the mattress.

2. Double pointed needle necessary.

3. Make a thick knot at end of twine.

4. Put the needle in 2in. from the corner and ½in. from the top at the box side, and take it well in towards the centre at top of mattress, draw nearly through, then push it back and take it out 2in. further along from the starting point.



5. Take a ¼in. back stitch at the box side and repeat until completion of the mattress.

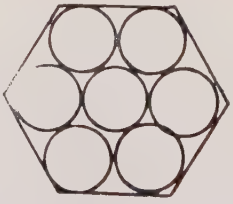
6. Draw twine moderately tight and fasten securely but neatly.

7. Quilt top and bottom of the box sides.

The ¼in. stitch is all that is visible—the twine is holding the stuffing at the sides in loops on the inner part of mattress.

FOOTSTOOL FROM OLD JAM TINS.

Materials.—Seven tins, ¼lb. kapok, ½yd. calico, old stockings, cardboard material.



Method.

1. Make holes in tins for fastening together.

2. Cover each tin with old stocking to prevent tins rattling, tie together firmly.

3. Place on cardboard and draw shape with a ruler; make this into a hexagon. Cut four cardboards the same shape.

4. Place a strip of calico around tins and one piece of cardboard top and bottom to give shape.

5. Cover with cretonne and material as desired.

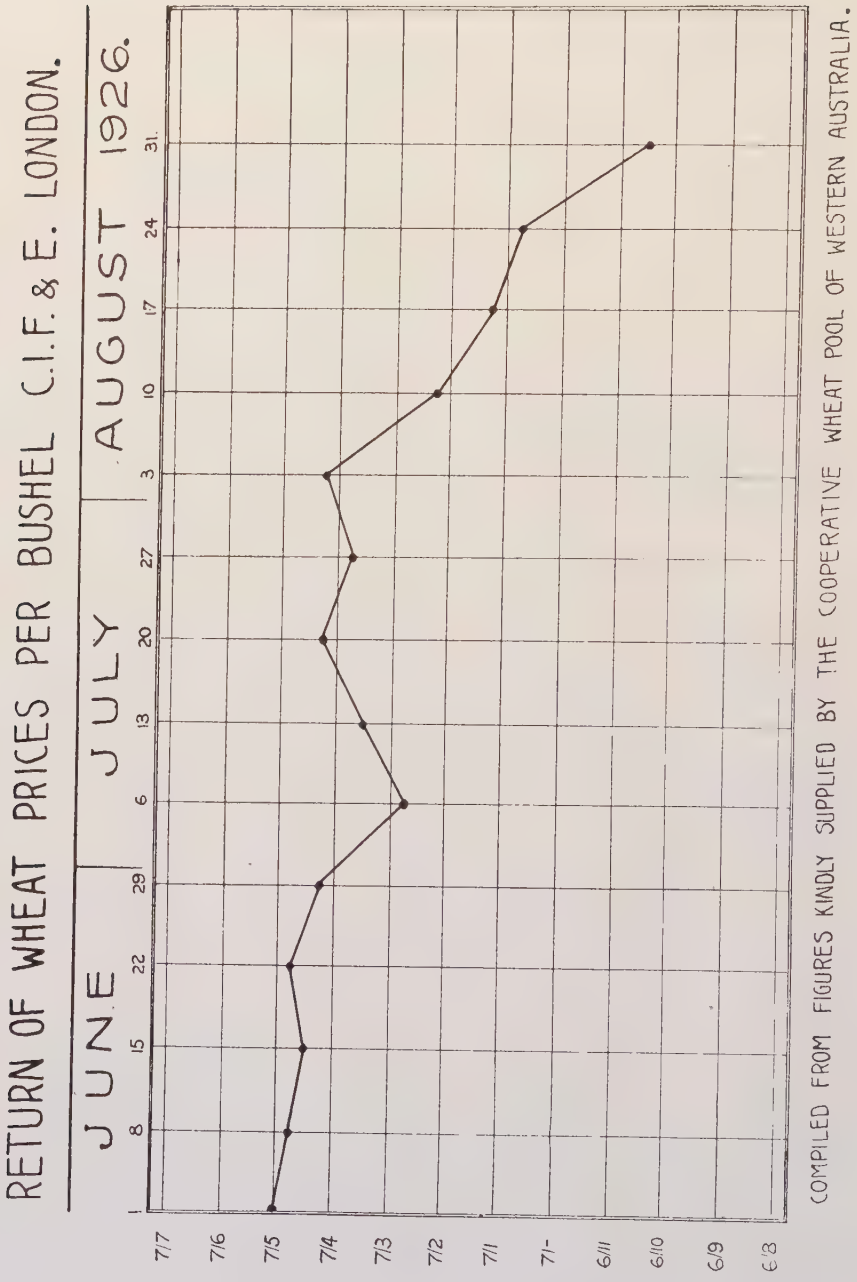
6. *Top.*—Cut a cushion 2in. larger than cardboard, fill with kapock, cover with material, sew on side flaps, and top sew to tins.

7. Cover last cardbord with material and sew to bottom of tins.

METEOROLOGICAL INFORMATION.

1926.

Stations.	Temperature.				Rainfall.		Temperature.				Rainfall.		Temperature.				Rainfall.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	JUNE, 1926.						JULY, 1926.						AUGUST, 1926.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman Farm State	66·5	75·4	45·6	37·8	3·70	4·11	64·2	68·8	46·4	38·2	5·55	3·89	64·5	72·5	43·6	36·8	2·67	2·73
Geraldton	69·4	78·7	52·5	42·7	3·03	4·76	67·4	73·0	55·1	47·0	4·01	3·90	66·9	70·6	51·9	42·0	2·31	2·96
Walebing	62·5	70·0	43·0	33·0	4·12	3·95	59·7	67·0	43·1	36·0	6·92	3·60	60·2	70·0	41·0	31·0	3·30	3·05
Perth	64·2	70·6	49·4	41·4	6·85	6·92	61·4	67·5	50·1	39·6	12·28	6·46	62·1	67·8	48·9	39·2	6·12	5·62
Kalamunda	62·5	76·8	47·5	41·5	7·93	7·98	58·8	67·6	47·0	40·2	14·09	7·72	60·2	68·5	46·1	39·0	7·37	6·66
Bunbury	63·8	67·8	48·7	42·2	5·33	7·19	61·4	66·2	49·0	35·2	9·04	6·96	62·1	65·2	47·8	36·2	4·99	5·44
Bridgetown	60·9	65·0	40·9	32·2	5·08	5·85	57·7	65·0	42·6	32·5	10·94	5·71	60·4	66·3	42·3	31·0	5·85	5·10
Albany	65·0	68·0	47·2	40·0	3·15	5·51	59·4	66·2	47·1	40·4	7·98	5·45	59·1	68·4	46·5	39·4	4·62	5·22
Merredin Farm State	61·6	71·9	43·1	36·6	2·02	1·82	58·9	66·3	44·3	31·8	2·67	1·91	60·4	72·1	40·2	30·1	0·94	1·45
Northam	63·9	70·2	40·7	35·2	2·91	3·30	59·4	67·5	44·8	34·0	6·47	3·32	60·6	70·0	43·7	34·8	2·42	2·58
York	63·3	69·0	42·5	34·0	2·62	3·36	60·2	67·0	44·3	32·4	8·30	3·25	61·8	70·8	42·9	33·0	2·18	2·86
Narrogin Farm State	58·8	64·2	42·4	34·2	2·90	3·65	57·0	63·4	42·4	31·9	8·37	3·95	57·9	65·7	41·2	31·7	2·05	3·22
Katanning	58·1	63·4	43·0	33·0	2·34	2·86	55·8	62·4	43·3	32·0	6·85	2·95	57·7	65·7	41·9	33·0	1·57	2·58
Cape Leeuwin ...	62·4	66·5	53·4	42·0	6·79	6·83	59·9	63·5	51·8	46·2	9·99	7·08	58·7	61·8	51·5	44·0	5·54	5·20


RETURN OF WHEAT PRICES PER BUSHEL C.I.F. & E. LONDON.
JUNE
JULY
AUGUST 1926.
1
8
15
22
29
6
13
20
27
3
10
17
24
31.
7/7
7/6
7/5
7/4
7/3
7/2
7/1
7/-
6/11
6/10
6/9
6/8
COMPILED FROM FIGURES KINDLY SUPPLIED BY THE COOPERATIVE WHEAT POOL OF WESTERN AUSTRALIA.

MARKET REPORT.

The following particulars concerning the various produce markets have been supplied us by Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth.

Chaff.—The undermentioned are the quantities of both wheaten and oaten chaff to hand at the metropolitan chaff and grain auction sales:—

Wheaten Chaff—

June—Quantity, 1,200 tons.
Maximum price, £8 5s. per ton.
Minimum price, £7 5s. per ton.

July—Quantity, 1,300 tons.
Maximum price, £7 17s. 6d. per ton.
Minimum price, £7 10s. per ton.

August—Quantity, 1,700 tons.
Maximum price, £8 per ton.
Minimum price, £5 10s. per ton.

In our last report we mentioned that we anticipated that satisfactory prices would rule for the next two or three months, and advised farmers having supplies to steadily market. If the above particulars are studied, it will be seen that our surmise was correct, and that supplies arriving were not heavy, and good prices ruled until August, when it will be noted that the market dropped to £5 10s. We would mention, however, that this £5 10s. only ruled for one day, and was caused by farmers holding supplies becoming nervous at the approach of the new season and rushing to market. However, immediately the price receded to £5 10s., buyers became more inclined to carry stocks, and farmers, seeing how the market had collapsed, were reluctant to forward to auction. This had the effect of again firming the market, and at the time of writing (6th September, 1926), the market has, to some extent, recovered, and f.a.q. to prime wheaten chaff is selling at around £7 per ton.

We have received advice from various farmer friends on the Eastern Goldfields line that they intend to commence hay-cutting almost immediately, and given fine weather, new season's chaff should make an appearance on the market about the 1st October. Taking this into consideration, we feel that farmers still having supplies of old season's to dispose of would be well advised to consign to auction immediately.

Oaten Chaff.—Taken throughout the period, supplies have been heavier than usual, but with the high price ruling for wheaten, the demand for oaten was better, and has been in demand at approximately £1 per ton under the price ruling for wheaten. From all appearances supplies appear to be ample until new season's is on the market, and we do not think that farmers have anything to gain by holding.

Oats.—In our last report we mentioned that we did not think there was much possibility of the market improving, and throughout the period under review the market for good heavy feeds has been steady at from 2s. 6d. to 2s. 8d. per bushel. At one period, under weight of supplies coming to hand,

this price receded about 3d. per bushel, but, owing to the heavy rains and consequent bad state of the roads, supplies dwindled and the market recovered. Supplies in the country are more than sufficient to meet the demand, and we still think there is very little possibility of improvement in values.

Wheat.—Satisfactory prices have ruled throughout, and at time of writing there is an excellent demand for f.a.q. at around 6s. 7d. per bushel. Quality approaching this, 6s. 3d. to 6s. 4d. Smutty and inferior at lower rates, according to sample.

Barley.—Very few consignments are finding their way to market. However, the demand is restricted, and the nominal value of good, clean Cape is 3s. 9d. per bushel.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith, & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF JUNE, JULY, AND AUGUST, 1926.

—	JUNE.					JULY.				AUGUST.			
	2.	9.	16.	23.	30.	7.	14.	21.	28.	4.	11.	18.	25.
Sheep and Lambs	6,456	7,762	6,797	9,830	11,917	10,662	10,179	4,736	13,450	10,694	10,928	10,823	10,168
Cattle ...	1,040	688	752	759	740	906	533	476	653	610	745	750	813
Pigs ...	644	507	734	516	964	748	485	321	981	802	1,026	823	791

COMPARATIVE VALUES OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF JUNE, JULY, AND AUGUST, 1926.

—	JUNE.					JULY.				AUGUST.			
	2.	9.	16.	23.	30.	7.	14.	21.	28.	4.	11.	18.	25.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton	9¼	9	9	8½	8	8½	8¾	10	8½	8¼	8	7½	7
Beef ...	5½	5¾	5¾	5¾	5¾	4¾	6	7	8	7½	6	4¾	4¾
Pork ...	9¾	10	10	10	10¼	10¼	11	11	11	11¼	11¼	11¼	11
Bacon ...	9¼	9¼	9¼	9¼	9¼	9	9	9	9	9	9	8	8½

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

List of Bulletins available for Distribution.

No. 5.—*Fruit Drying.* By J. F. Moody. Free.
No. 15.—*Root Rot.* By A. J. Despeissis. Free.
No. 20.—*The Pruning of Fruit Trees.* By J. F. Moody. Price 2s. 6d.
No. 30.—*Codlin Moth.* L. J. Newman. (Reprint from "Journal.")
No. 46.—*Fruit Packing and Marketing and Exporting of Fruit.* By J. F. Moody and J. Ramage Price 1s. 6d.
No. 47.—*The Poultry Keeper's Manual.* By G. Allman. Price 1s.
No. 49.—*The Feeding of Horses.* By Professor Paterson and G. L. Sutton. Free.
No. 57.—*Vermin Destruction.* By A. Crawford. Free.
No. 60.—*The Farmer's Clip.* By J. J. Mahood. Free.
No. 68.—*Flaying and Treatment of Hides.* By R. E. Weir. Free.
No. 72.—*The Potato: Its Cultivation, Pests, and Diseases.* By G. N. Lowe, L. J. Newman D. A. Herbert. Free.
No. 74.—*Tobacco Growing: Notes for Intending Planters.* By G. W. Wickens. Free.
No. 79.—*Sheep on the Wheat Farm and their Management in W.A.* By H. McCallum. Free
No. 83.—*Horticulture and Viticulture.* By A. Despeissis. Price 2s.
No. 87.—*Sheep Feeding Experiments: State Farm, Chapman,* 1920. By G. L. Sutton and F. Vanzetti. Free.
No. 88.—*Light Land: Conference.* By G. L. Sutton. Free.
No. 90.—*Stock Waters: Standard for Composition of.* By E. A. Mann. Free.
No. 93.—*The Home Tanning of Sheep and other Skins.* By H. Salt. Free.
No. 94.—*The Dingo.* By B. W. Leake. Free.
No. 96.—*Poison Plants of W.A.* By D. A. Herbert. Free.
No. 99.—*Australian White.* By G. L. Sutton. Free.
No. 101.—*Cotton Cultivation.* By G. L. Sutton. Free.
No. 103.—*Kerosene Method for Eradicating the Zamia Palm.* By G. K. Baron-Hay. Free
No. 104.—*Stickfast Flea.* By J. G. C. Campbell. Free.
No. 105.—*Pedigree Selection of Seed.* By G. L. Sutton. Free.
No. 106.—*The Red Legged Velvet Earth Mite.* By L. J. Newman. Free.
No. 107.—*Sudan Grass.* By G. L. Sutton. Free.
No. 109.—*Rape.* By G. L. Sutton. Free.
No. 111.—*Standard Wheat Varieties.* By G. L. Sutton and F. Vanzetti. Free.
No. 112.—*Automatic Device for Eradication of Stickfast Flea.* By G. Allman. Free.
No. 113.—*Picked Pieces (Classification of Clip).* Free.
No. 114.—*Blue Mould on Citrus Fruits.* By W. M. Carne. Free.
No. 115.—*The Value of Windmills for Pumping Water in W.A.* A. H. Scott.
No. 116.—*Spotted Wilt of Tomatoes.* W. M. Carne.
No. 117.—*Cream.* P. G. Hampshire.
No. 118.—*Pigs and Pig Raising.* P. G. Hampshire.
No. 119.—*Take-all of Wheat and Similar Diseases of Cereals.* By W. M. Carne and J. G. C. Campbell.
No. 120.—*Pastures in the South-West.* A. B. Adams. (Reprint from "Journal.")
No. 121.—*Mildew, Septoria, Leaf Spots, and Similar Diseases of Cereals.* W. M. Carne and J. G. C. Campbell.
No. 122.—*Fruit Fly. Description and Control.* L. J. Newman.
No. 124.—*Government Inspection of Wheat.* G. K. Baron-Hay. (Reprint from "Journal.")
No. 125.—*Buy Good Seed.* (Advice to Farmers.) W. M. Carne. (Reprint from "Journal.")
No. 126.—*The Rust of Cereals.* W. M. Carne and J. G. C. Campbell.
No. 127.—*Wheat Yields—Competitions.*
No. 128.—*Woolly Aphis Parasite (Aphelinus mali).* (Hald.) L. J. Newman. (Reprint from "Journal.")
No. 129.—*The Farm Horse: Hints on Feeding.* A. McK. Clark. (Reprint from "Journal.")
No. 130.—*Minerals and the Health of Cattle* A. B. Adams. (Reprint from "Journal.")
No. 131.—*The Strength of Wheat and Flour.* R. G. Lapsley. (Reprint from "Journal.")
No. 133.—*Kikuyu Grass for Poultry.* G. L. Sutton. (Reprint from "Journal.")
No 134.—*Flag Smut of Wheat* W. M. Carne. (Reprint from "Journal.")
No. 135.—*The Objects of Farmers' Trials.* G. L. Sutton. (Reprint from "Journal.")
No. 136.—*The use of the Scythe.* H. Campbell. (Reprint from "Journal.")
No. 137.—*Winter Trapping of the Fruit-fly.* L. J. Newman. (Reprint from "Journal.")
No. 138.—*Clearing Heavily-timbered Pastures.* A. B. Adams. (Reprint from "Journal.")

No. 140.—*Surface Draining.* A. R. Clifton. (Reprint from "Journal.")
No. 141.—*Breeding a Permanent Flock.* H. McCallum. (Reprint from "Journal.")
No. 142.—*The Plague Locust.* L. J. Newman. (Reprint from "Journal.")
No. 143.—*Zamia Palm.* A. B. Adams and G. K. Baron-Hay (Reprint from "Journal.")
No. 144.—*Ants as Pests.* J. Clark. (Reprint from "Journal.")
No. 145.—*The Tuart Bud Weevil.* L. J. Newman and J. Clark. (Reprint from "Journal")
No. 146.—*Development of a Dairy Herd.* P. G. Hampshire. (Reprint from "Journal.")
No. 147.—*Cultivation of the Potato.* G. N. Lowe. (Reprint from "Journal.")
No. 148.—*Maize—The King of Fodder Crops.* G. L. Sutton. (Reprint from "Journal.")
No. 149.—*Lucerne.* G. L. Sutton. (Reprint from "Journal.")
No. 150.—*Subterranean Clover.* A. B. Adams. (Reprint from "Journal.")
No. 151.—*Blow Fly Traps.* L. J. Newman. (Reprint from "Journal.")
No. 152.—*Bee Diseases.* H. L. Cailes. (Reprint from "Journal.")
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The Handbook of Horticulture and Viticulture of Western Australia, by A. Despessis, M.R.A.C.:

This publication contains valuable information dealing with all commercial fruits grown in Western Australia, including advice on planting, pruning, packing, manuring, fruit-drying, wine-making, insect and fungoid pests and their treatment, etc., and the whole forms a text book which every fruitgrower, whether large or small, should have in his possession. The price originally was 8s. 6d., but to allow of distribution being as wide as possible it has been reduced to 2s.

Agricultural Bank.

ADVANCES TO FARMERS:

The Agricultural Bank, which is a State institution and is worked under a Special Act, was founded with the object of making advances to settlers for the purpose of assisting and encouraging them during the early years of the development of their farm.

The Agricultural Bank makes advances on approved securities to approved persons engaged in the business of farming or grazing, or in horticultural pursuits, to an amount not exceeding £2,000.

Every application must be made on the prescribed form, and must contain full particulars of the purposes for which the advance is required.

Where an advance is approved for effecting improvements on the borrower's land, such advance is made by progress payments as the work progresses.

Developmental advances are usually made for clearing, fencing, ringbarking, and water supply, and are made to the full value of the work done after it has been inspected and certified to by a responsible officer. After a reasonable stage of development has been reached, and providing the general progress of the settler is considered satisfactory, limited assistance is granted towards building (maximum £250), and money is provided to assist in the purchase of stock and machinery, the maximum amount for this purpose, except in special cases, being £150.

Interest is charged at the rate of seven per cent. per annum, and repayment of principal extends over a period of 30 years, except in the case of stock or machinery advances which have a currency of eight years only.

The security required by the Bank is a first mortgage over the lands on which the advance is to be expended, and such lands may consist of:—

(a) Holdings in fee simple; or
(b) Holdings under Special Occupation Lease or Conditional Purchase from the Crown; or
(c) Homestead Farms; or
(d) Such other real or leasehold property as the Trustees may think fit.

Mortgages are prepared free of charge; but borrowers are required to pay the statutory costs of registration.

Interest only on the advances made is charged during the first 10 years, and repayment of the capital does not commence until the eleventh year.

Application may be for sums of £25, or any multiple thereof, not exceeding £2,000. Each application must be accompanied by a valuation fee of one per cent. of the amount applied for. No refund of fee is allowed after an inspection of the security has been made.

The leases, or Occupation Certificate, as the case may be, together with the fees, must be in the possession of the Bank before a mortgage can be prepared.

REGISTRATION FEES.

	s.	d.
For each Conditional Purchase, Homestead Farm, or Grazing Lease under the Land Act	5	0
For each Freehold Lot or Crown Lease	10	0
For every additional Freehold Lot or Crown Lease	2	0

STAMP DUTY.

	s.	d.		s.	d.
Up to £50	1	3	From £301 to £400	10	0
From £51 to £100	2	6	„ £400 „ £500	12	6
„ £101 „ £150	3	9	Stock Bill of Sale, up to £50	5	0
„ £151 „ £200	5	0	„ „ over £50	10	0
„ £201 „ £250	6	3	Machinery Bill of Sale, up to £50	5	0
„ £251 „ £300	7	6	„ „ „ over £50	10	0

Intending borrowers are requested to note that no advances are made against improvements effected prior to date of application. Applications should, in every instance, be lodged prior to commencement of work, and moneys are then paid over in progress payments as the work proceeds.

IMPROVED FARMS.

The Trustees of the Agricultural Bank have, from time to time, improved farms on their hands which have been abandoned for various causes, or have been taken over as security for loans. These farms are available for purchase, and extended terms are given for payment of the amount. They often offer to intending settlers an opportunity of obtaining an improved holding, ready for occupation, at a cheap rate, without having to undertake the preliminary work of clearing and fencing. The properties, when obtainable, are advertised in the "Government Gazette"; but anyone wishing for particulars of such farms as may be available should make application to the Managing Trustee of the Agricultural Bank. Particulars will then be sent, and an inspection can be made by the intending settler to ascertain whether the same is suitable for his requirements.

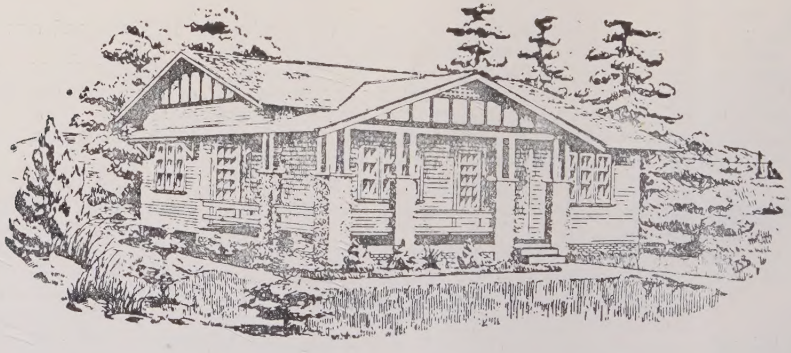
Every man has his ideals

—And naturally it is to be expected that SOME REFLECTION of these ideals would be found in his HOME LIFE of which the HOME ITSELF forms an integral part.

Does your present dwelling satisfy you in this respect? Does it reflect your ideals? If not, then it is time that you considered the question of something better.

Write to us, enclosing a rough ground plan and we will prepare a plan, specification, and price to suit your pocket.

Nothing too large nor too small for us to undertake.



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